SACO-LOWELL TWISTERS

AS BUILT AT LOWELL, MASS.

TEXTILE MACHINERY

WITH SPECIAL REFERENCE TO THE

TWISTERS

BUILT BY SACO-LOWELL SHOPS
AT LOWELL, MASSACHUSETTS

FIRST EDITION

SACO-LOWELL SHOPS

Executive Offices
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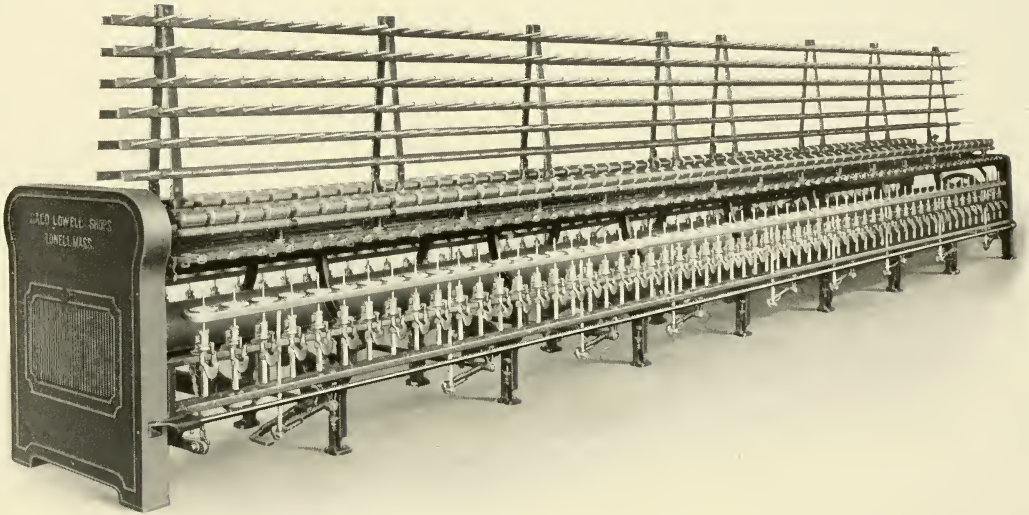
Shops
BIDDEFORD, MAINE · LOWELL, MASS.
NEWTON UPPER FALLS, MASS.

Southern Agent
ROGERS W. DAVIS · CHARLOTTE, N. C.



Dry Ring Twister

Ring Twisters

OUR ring twisters, both for wet and dry twisting, are built with a large margin of strength and weight and a low center of gravity, thus securing great rigidity and elimination of the vibrations usually found at the increasing speeds required by modern practice.

They are meeting the exacting requirements of progressive mills, twisting from fine thread yarns and hosiery up to the heaviest duck and tire fabric yarns of multiple ply.

36, 39, and 42 inch widths are provided, with any number of spindles required. The adjustable foot used on all of our samsons provides for maintenance of level.

DRIVING PULLEYS. Our improved outrigger bearing furnishes ample support for the head shaft, and insures proper alinement, at the same time facilitating removal and proper replacement for change of pulleys.

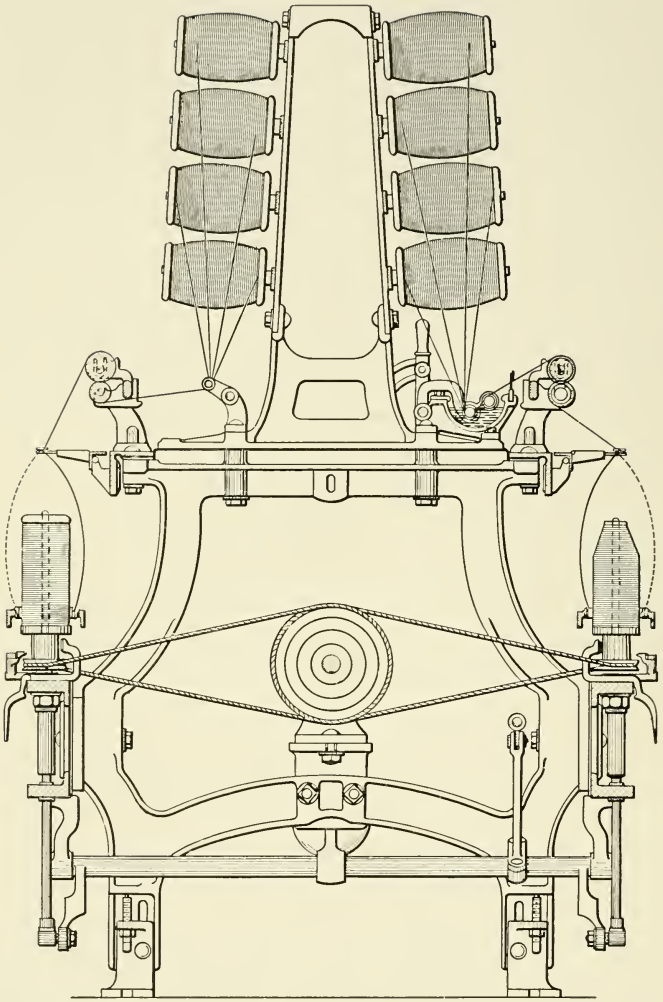
Ample provision is made for lubrication of loose pulleys, which are carried on a sleeve supported by outrigger independent of main shaft. Loose pulleys are slightly smaller in diameter for reducing belt tension.

BELT SHIFTER. Light twisters are provided with the ordinary form of belt shifter. A special and positive shifting device, with hand wheel and worm gear to insure absence of shock and slippage in starting, is sometimes provided for extra heavy duty.

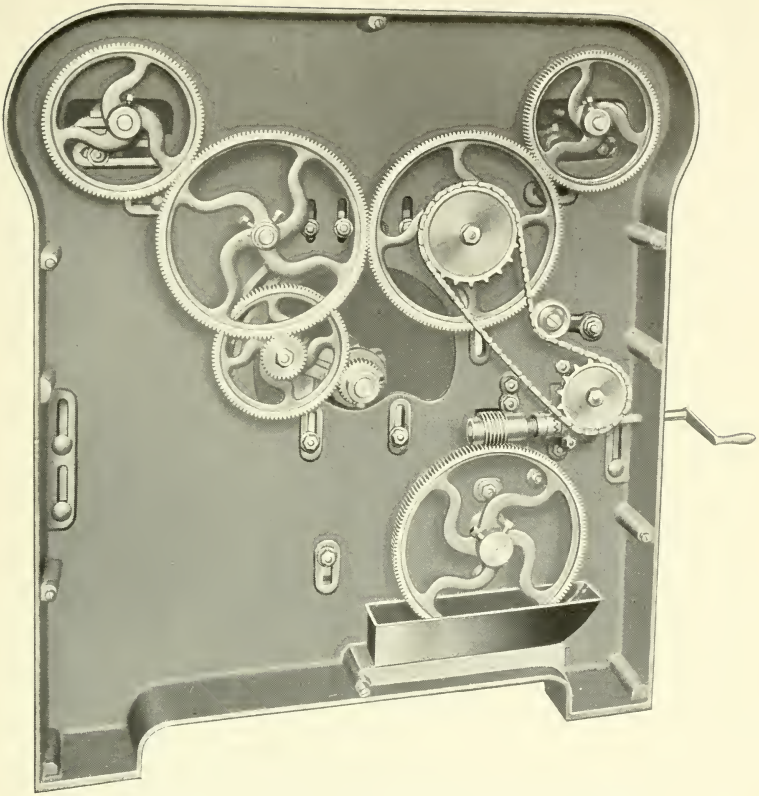
GEARING. Cut gears are used exclusively, all the gearing being enclosed in the foot end, with a special arrangement to facilitate changes. Gearing for independent twist on each side is optional. Our standard cylinder, stud and front roll gearing combinations will be found tabulated hereinafter. Special combinations can be supplied as required.

The builder drive is of the chain and sprocket type, with special provision to eliminate back lash and play of worm shaft and to insure proper lubrication of worm.

CREELS. Metallic construction is used entirely with accurately spaced pins having inverted cup washers to prevent spool heads contacting with creel slats. In some cases pins may be



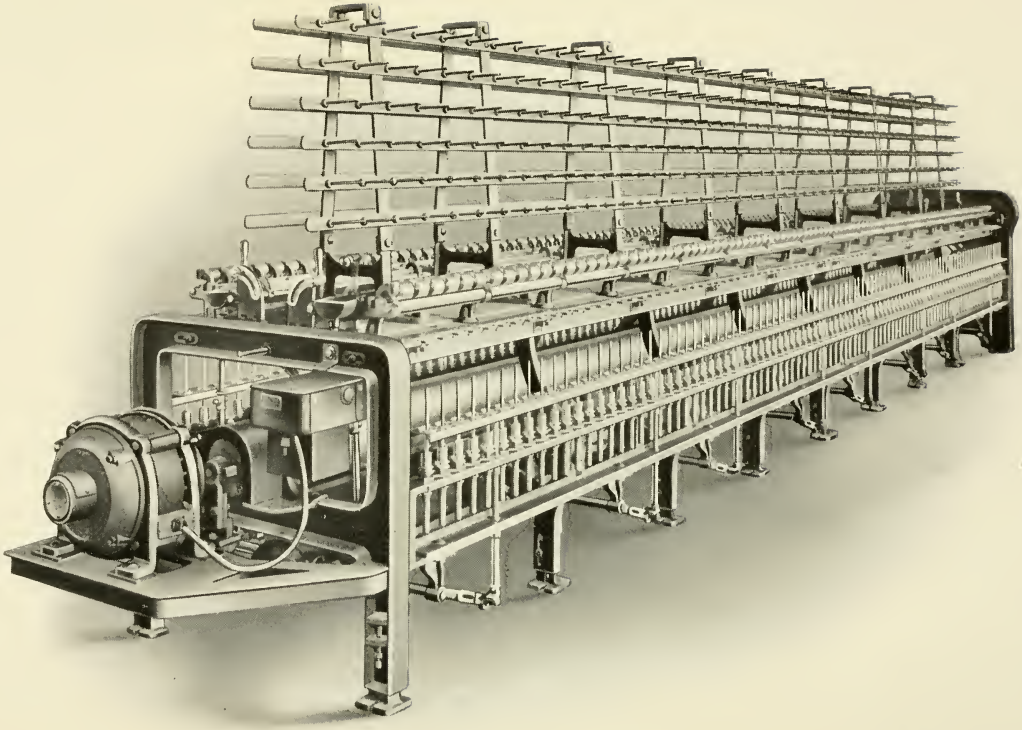
Section of Ring Twister, One Side Dry, One Side Wet



Gearing and Foot End of Ordinary Twister

vertically offset. Creels may be constructed for vertically positioned cops, the threads passing upward over a guide eye and downward to the rolls. Creels are furnished for 16 ply or less.

YARN GUIDE RODS. A horizontal steel rod is supported by stands on the creel board and carries adjustable arms having porcelain grooved guides for combining and guiding the ends of yarn from the creel. The combined ends then pass to the rolls in the



Wet Ring Twister with Motor Drive

case of dry twisters, but to positively traversed guide rods in the case of wet twisters.

WATER TROUGHS FOR WET TWISTING. These are of sheet brass, strongly supported, slightly pitched to the drainage end to provide for circulation. Drainage outlets are supplied with removable hollow plugs to prevent overflow. Glass rods having brass fittings guide the yarn and a lifting device permits removal of yarn from water by raising the rods. All parts in contact with water are of brass, glass or porcelain. Revolving brass rolls in water troughs may be substituted if desired, an extra rod removing surplus water.

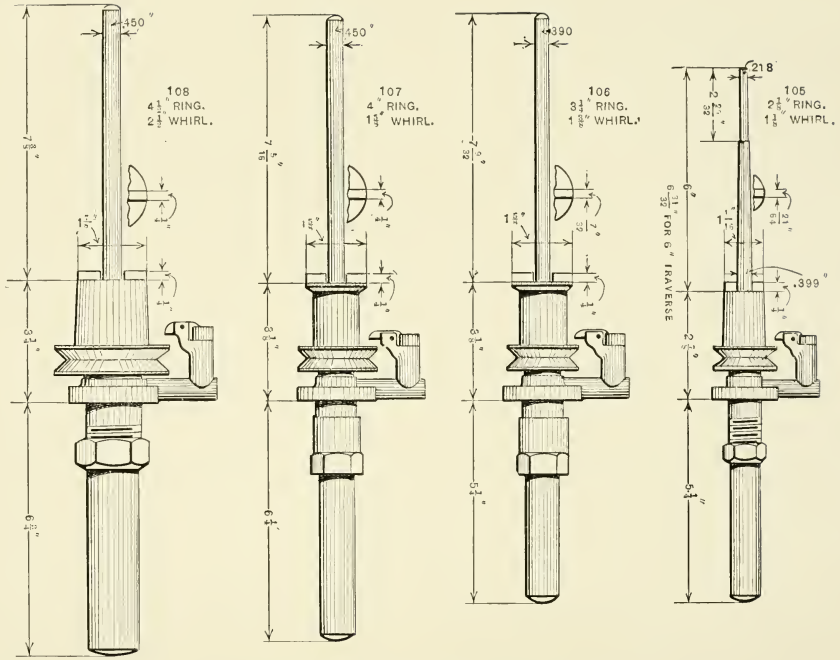
ROLLS AND ROLL STANDS. Roll stands have wide roll bearings, those for the front line being of bronze when desired. Stands and rolls are furnished for single line bottom and top rolls, double line bottom and single line top rolls or double line bottom and top rolls. The rolls may be fluted for special work. Bottom rolls are accurately ground to standard gauges. Top rolls may be extra large in diameter for heavy work. Bottom and top rolls for wet twisting are brass covered. Cap bars have rests for convenience in setting off top rolls. When leading over top rolls to thread guides a specially grooved top roll is used which prevents the yarn from twisting over the end of roll when spindles are coming to rest. Overhanging roll stands will be furnished when desired.

We have special designs of stands for twisting together combinations of silk, cotton, ramie, asbestos, wire and other materials.

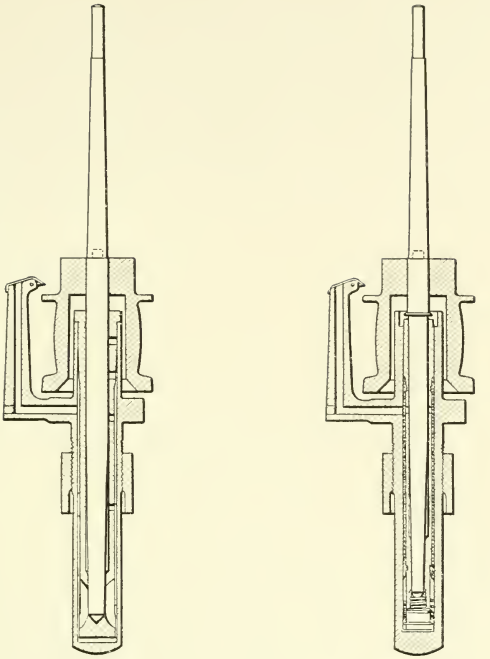
THREAD BOARDS AND GUIDES. Metallic thread boards are recommended but the usual form of wooden boards will be furnished when desired, also various forms of glass or porcelain guides for wet twisting.

SPINDLE RAILS, RING RAILS AND APPURTENANCES. Spindle rails are of the boxed type so designed as to insure great rigidity. Short, stiff ring rails with two lifting rods are ordinarily used, and three rods are provided for extra rigidity on heavy duty and high speed. Lifting rods have extra long bushings and may be fitted with cleaners. Large vertical rings may be provided with wick-oiling device. For dry twisting, rails are of cast iron.

The ring rail for wet twisting is of heavy formed sheet brass with the rings either secured directly in the rail by a forced fit or held in brass plate holders, as conditions may require.



RING TWISTER SPINDLES, BAND DRIVE



Ring Twister Spindles, Tape Drive

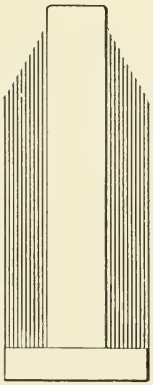
RINGS may be vertical or flanged, of any desired type. Those for dry twisting are usually made flanged for the smaller diameters and vertical for the larger. Vertical rings are used exclusively for wet twisting.

SPINDLES. We furnish any style of modern twister spindle of the single rail type and of our own manufacture in weights to suit the work to be performed. They may be fitted with knee brakes of improved design protected by a truck guard rod.

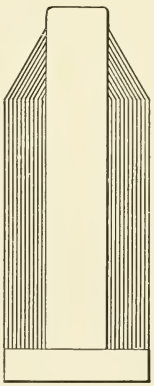
SEPARATORS. When desired we supply separators either secured directly to the ring rail or of the reciprocating type common to our ring spinning frames.

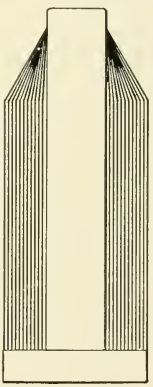
SPINDLE DRIVING ARRANGEMENTS. Cylinders are constructed of two thicknesses of heavy tin with lapped joints and liberal interior reinforcement. They are made in short lengths, balanced at high speed and practically noiseless in operation. Cylinders of 7, 8, 9 or 10 inches diameter are furnished as desired. Bearings are of modern type provided with chain or ring oilers and return oil channels. Head and foot end bearings are rigid, intermediate and outrigger bearings are self-alining.

The spindle drive may be either band or tape. The tape drive for light work is of the patented geometric hanging type, a modification of the worsted spinning type. For heavy duty the tape drive may be of the geometric type in heavier construction or of the Finlayson sliding type. Both of these types maintain the tension pulley in the plane of the leading on portion of tape. Reversal of twist may be secured by a change in position of the tension hangers and tapes, and frame may be changed readily to the opposite hand.



Dwight Builder





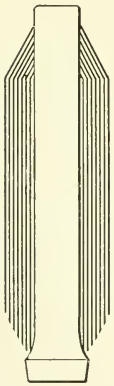
Builder with Nosing Attachment

BUILDER MOTIONS. Several varieties of winds may be obtained with our builder motions in addition to the usual straight, warp or filling wind. The accompanying diagrams show several special types.

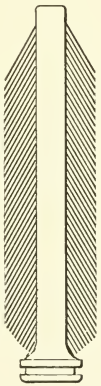
The Dwight Type Builder winds a bobbin having a square base and a taper top. The adjustment of the chain with respect to the builder arm is such that the shortening of the traverse only occurs at the upper end of the stroke. The winding may commence either with the short or with the long traverse.

The Builder With Nosing Attachment produces a bobbin with square base and taper top. It is wound throughout with the same length of traverse, the speed of the traverse being accelerated at the upper end to produce the taper. As the traverse remains constant, each bobbin is independent of every other bobbin and may be started or doffed at any time.

The Filling Builder With Warp Cam also has a constant length of traverse but the entire traverse is raised slightly at each reciprocation. This gives the taper top and bottom and as each layer at the top overlaps the preceding one, less trouble is experienced when unwinding.



Filling Builder with Warp Cam



Filling Builder with Bottom Former

The Filling Builder With Bottom Forming Attachment is for winding upon a filling bobbin without a taper base. The traverse is shortened at the commencement of winding, thus rounding out the bottom of the bobbin. As the winding progresses, the traverse gradually lengthens until it reaches the maximum

at which time the bobbin has been sufficiently rounded out at the bottom to commence upon the regular wind.

Winding down steps and doffing latches are furnished.

SLACKING OFF DEVICE. In starting up wet twisters when the traverse is at the bottom or when the frame has been standing for some time, it is desirable to slack off the ends, and to provide for this we have adopted an arrangement wherein the heart shaft is disengaged through the use of a clutch, and by using a socket-wrench the shaft may be operated independently.

Heavy Tape Drive Ring Twister

WE have recently designed a tape drive twister for heavy duty to which particular attention is called. Rigid construction throughout adapts it to fulfill without vibration the requirements of mills making tire duck and similar heavy fabrics.

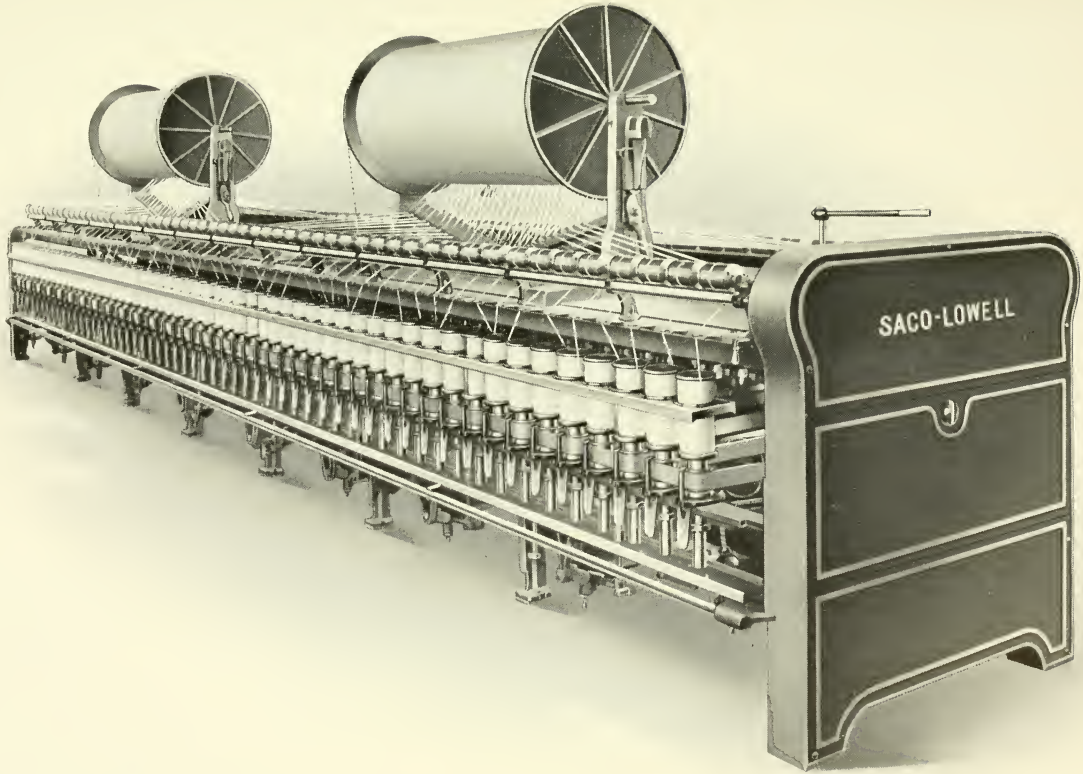
Spindles are driven by tapes 1″ to 2″ in width. Tension arrangements may be either a heavy construction of the swinging geometric type or of the sliding Finlayson type supported upon a rigid bar secured to the samsons.

The frame is equipped with the usual spool type of creel or adapted to twist from section beams as illustrated herein.

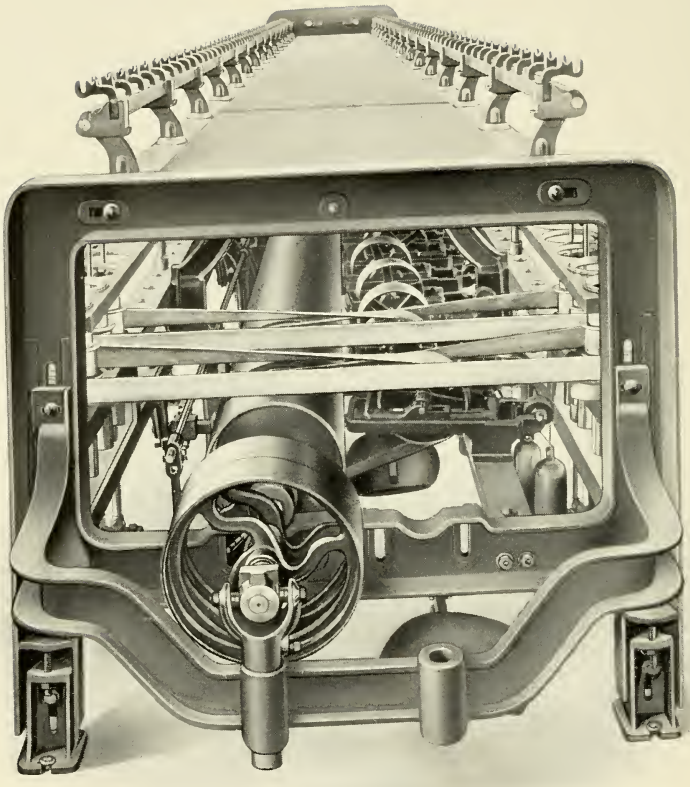
The latter method is very efficient with eight or more ply, and by its use the time necessary for creeling is greatly reduced, the breakages decreased, and the production correspondingly increased.

The gearing is arranged to twist each side independently.

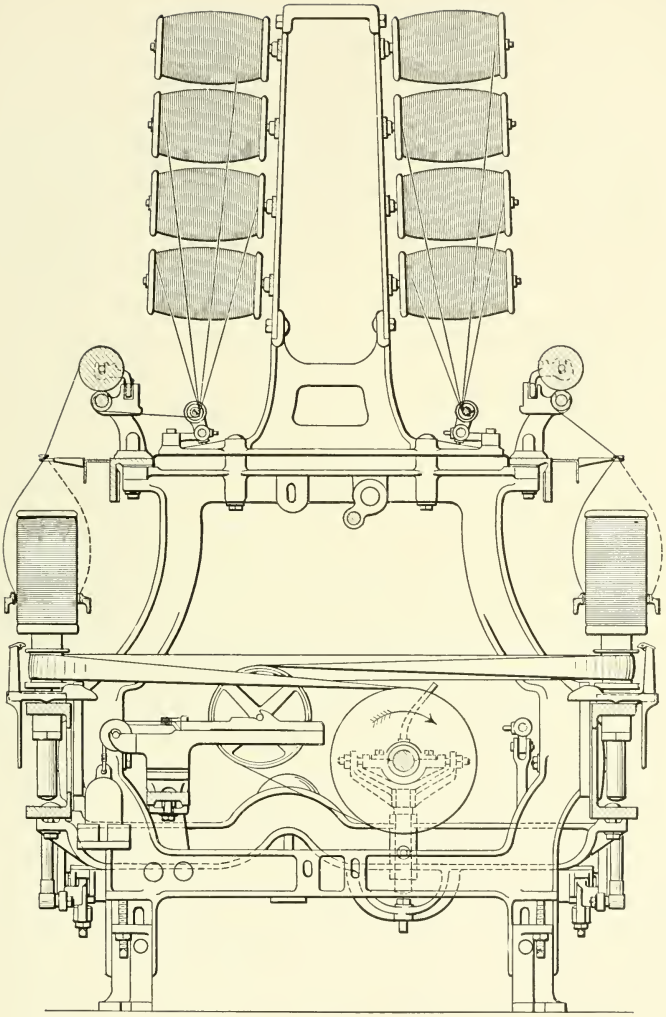
This frame is capable of producing even twist in coarse numbers of yarn as high as 16 ply.



Heavy Tape Drive Ring Twister with Beam Creel



Finlayson Tension for Heavy Tape Drive Ring Twister



Section of Heavy Tape Drive Ring Twister with Spool Creel

Foot End and Gearing of Heavy Tape Drive Ring Twister

Novelty Twister

THE novelty twister illustrated on the following pages is adapted to manufacture a very large variety of spiral, knotted, curled, looped, spotted and other fancy yarns.

Each side of the twister is driven independently of the other, the frame being provided with two pairs of driving pulleys, two lines of drums separately driven through step cones, and two builder motions. This permits two entirely independent operations simultaneously.

There are two lines of rolls, the front line connected with the drum shaft by a chain and sprocket drive and the back line driven from the front line. A change gear is provided for each line.

Pedal spindle brakes are furnished.

A large variation in the speed of the machine and in the relative speed of one line of rolls with respect to the other line may be obtained.

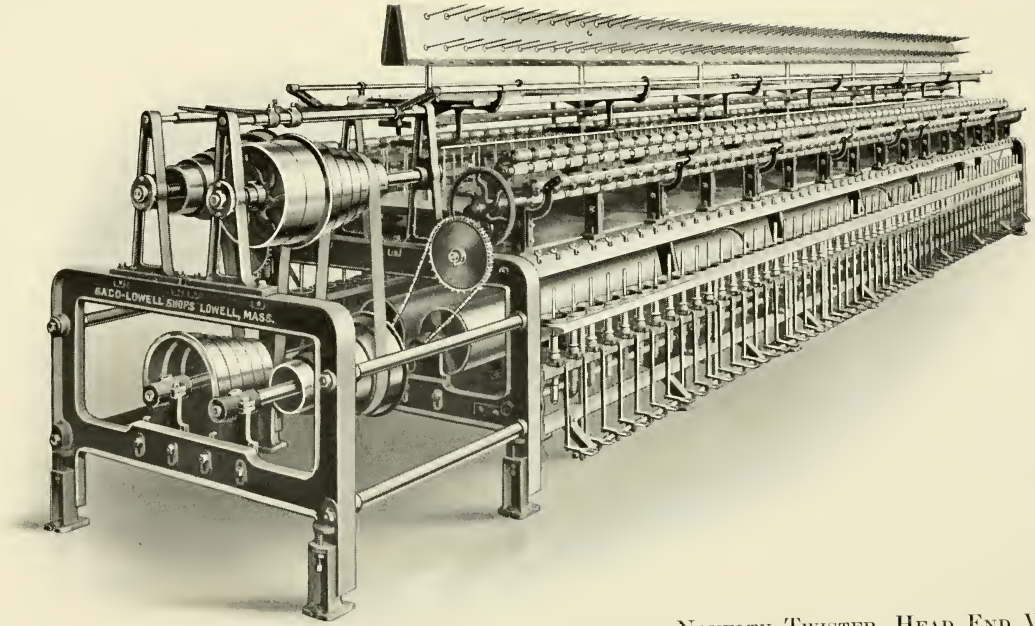
For producing uneven or spotted yarns a shield is provided to travel one yarn upon the other.

Creels are adapted to take spools, bobbins, cops or tubes.

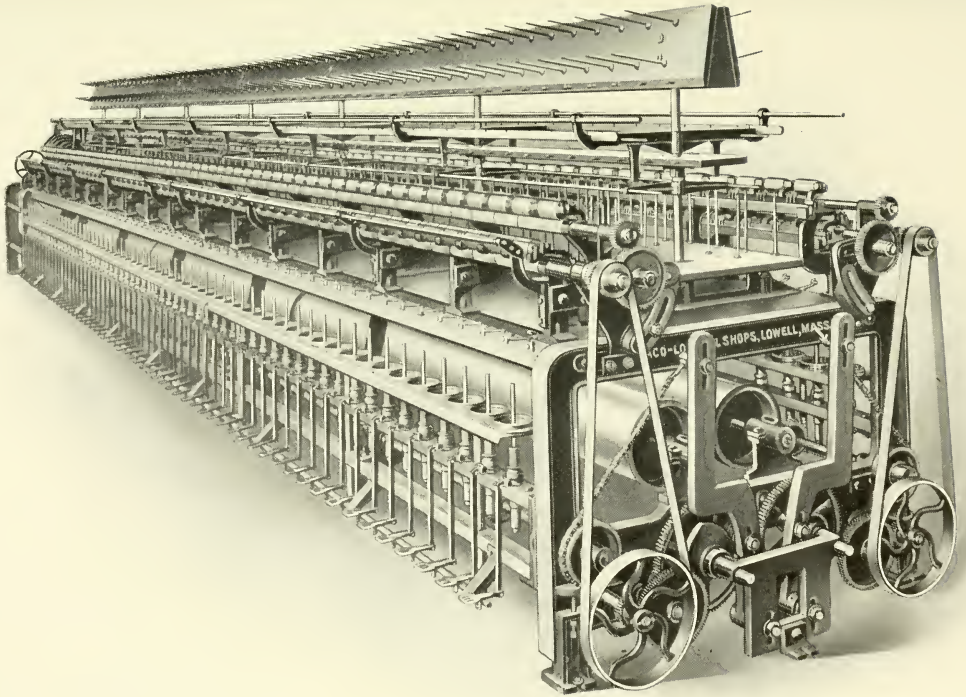
The width is 48″.

A variety of novelty yarns may be made upon our regular twister by adding a second line of rolls, operated from the first line by change gears. The yarns from the two lines of rolls may be of different colors and materials and delivered at different speeds to produce when twisted together any of the simpler forms of fancy yarn. More complicated yarns may be obtained by means of second and third operations.

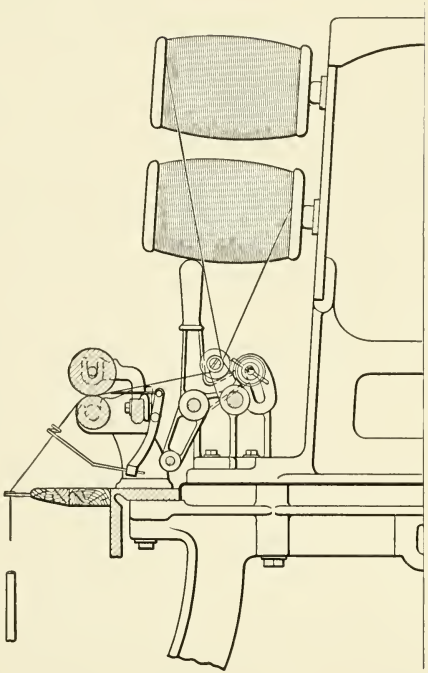
While the possibilities of the full novelty twister cannot be attained by these modifications of the ordinary twister, they make possible the filling of an appreciable portion of the trade demand for fancy yarn fabrics without the purchase of a special machine.



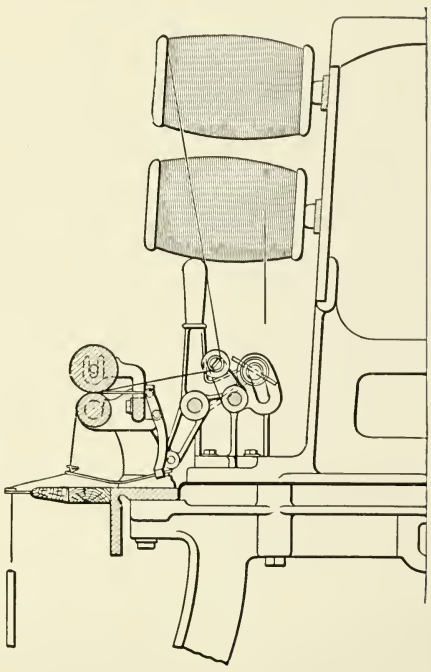
Novelty Twister, Head End View



Novelty Twister, Foot End View



Ends Intact



One End Broken

Section of Trap Portion of Ring Twister

Trap Twister

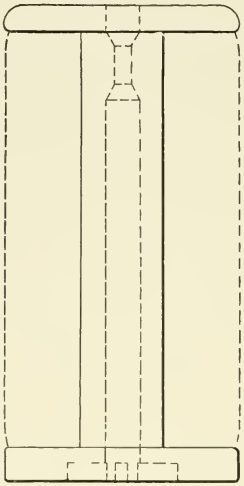
THE use of a trap motion is advisable under certain conditions. In twisting high grade yarn, breakages with the resultant wrapping of waste upon the top rolls cause considerable loss of valuable material. In twisting very poor stock, breakages due to weak yarn are apt to be so frequent that inconvenience results from the large amount of waste wrapped upon the top rolls.

Our trap motion lifts the top roll from the bottom roll upon breakage or undue slackening of the twisted yarn and holds the end securely until the operative can piece it up, thus preventing lapping of the broken end about the top roll.

It is used for two ply work only.

A releasing bar extends the length of the frame in the rear of the traps and may be operated at either end by a handle to hold the traps up when the frame is started.

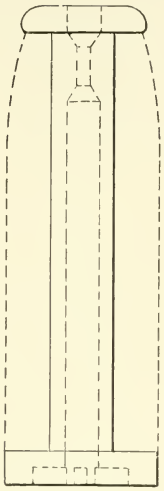
Types of Bobbins



STRAIGHT WIND

Size of Ring	Length of Traverse	Diam. of Heads	Diam. of Barrel	Lbs. of Yarn on Bobbin
2″	6″	1¾″	⅞″	.180
2¼″	6″	2″	⅞″	.254
2½″	6″	2¼″	1″	.319
2¾″	6″	2½″	1¼″	.368
3″	7″	2⅝″	1¼″	.488
3¼″	7″	2⅞″	1¼″	.614
3½″	7″	3⅛″	1½″	.689
4″	7½″	3⅝″	1½″	1.069
4½″	7½″	4″	1½″	1.350
5″	8″	4½″	1¾″	1.800
5½″	8″	5″	1¾″	2.297

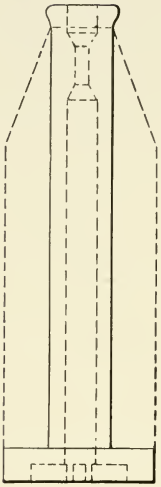
Types of Bobbins



PARTIAL TAPER TOP WIND

Size of Ring	Length of Traverse	Diam. of Bottom Head	Diam. of Top Head	Diam. of Barrel	Lbs. of Yarn on Bobbin
2″	6″	1¾″	1½″	⅞″	.173
2¼″	6″	2″	1¾″	⅞″	.243
2½″	6″	2¼″	2″	1″	.306
2¾″	6″	2½″	2¼″	1¼″	.353
3″	7″	2⅝″	2⅜″	1¼″	.471
3¼″	7″	2⅞″	2⅝″	1¼″	.592
3½″	7″	3⅛″	2⅞″	1½″	.664
4″	7½″	3⅝″	3⅛″	1½″	1.034
4½″	7½″	4″	3½″	1½″	1.305
5″	8″	4½″	4″	1¾″	1.744

Types of Bobbins



FULL TAPER TOP WIND

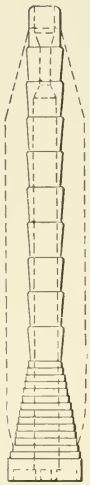
Size of Ring	Length of Traverse	Diam. of Head	Diam. of Barrel	Lbs. of Yarn on Bobbin
2″	6″	1¾″	⅞″	.169
2¼″	6″	2″	⅞″	.233
2½″	6″	2¼″	1″	.289
2¾″	6″	2½″	1⅛″	.351
3″	7″	2⅝″	1¼″	.440
3¼″	7″	2⅞″	1¼″	.548
3½″	7″	3⅛″	1½″	.615
4″	7½″	3⅝″	1½″	.944
4½″	7½″	4″	1½″	1.159
5″	8″	4½″	1¾″	1.533

Types of Bobbins

WARP WIND

Size of Ring	Length of Traverse	Diam. of Head	Diam. of Barrel	Lbs. of Yarn on Bobbin
2″	6″	$1\frac{13}{16}$″	$\frac{7}{8}$″	.169
$2\frac{1}{4}$″	6″	$2\frac{1}{16}$″	1″	.213
$2\frac{1}{2}$″	6″	$2\frac{5}{16}$″	1″	.277
$2\frac{3}{4}$″	6″	$2\frac{9}{16}$″	$1\frac{1}{4}$″	.319
3″	7″	$2\frac{3}{4}$″	$1\frac{1}{4}$″	.447
$3\frac{1}{4}$″	7″	3″	$1\frac{3}{8}$″	.518

Types of Bobbins



FILLING WIND

Size of Ring	Length of Traverse	Diam. of Head	Diam. of Barrel	Lbs. of Yarn on Bobbin
$1\frac{3}{4}''$	$6''$	$1\frac{9}{16}''$	$\frac{7}{8}''$	.118
$2''$	$6''$	$1\frac{13}{16}''$	$\frac{7}{8}''$	.171
$2\frac{1}{4}''$	$6''$	$2\frac{1}{16}''$	$1''$	.215
$2\frac{1}{2}''$	$6''$	$2\frac{5}{16}''$	$1''$	.277
$2\frac{3}{4}''$	$7''$	$2\frac{9}{16}''$	$1\frac{1}{8}''$	.399
$3''$	$7''$	$2\frac{3}{4}''$	$1\frac{1}{4}''$	.447

Flyer Twister

A FLYER twister will twist high ply which is beyond the capacity of a ring twister, will give a superior smoothness of twist, and will take a much larger bobbin.

Our flyer twisters have effectively met the requirements of mills twisting hose cords, bag sewing twine, cordage for the agricultural trade, stitching thread for belting, mop yarns, rope strands, and similar products. Their operation involves very little expenditure for repairs.

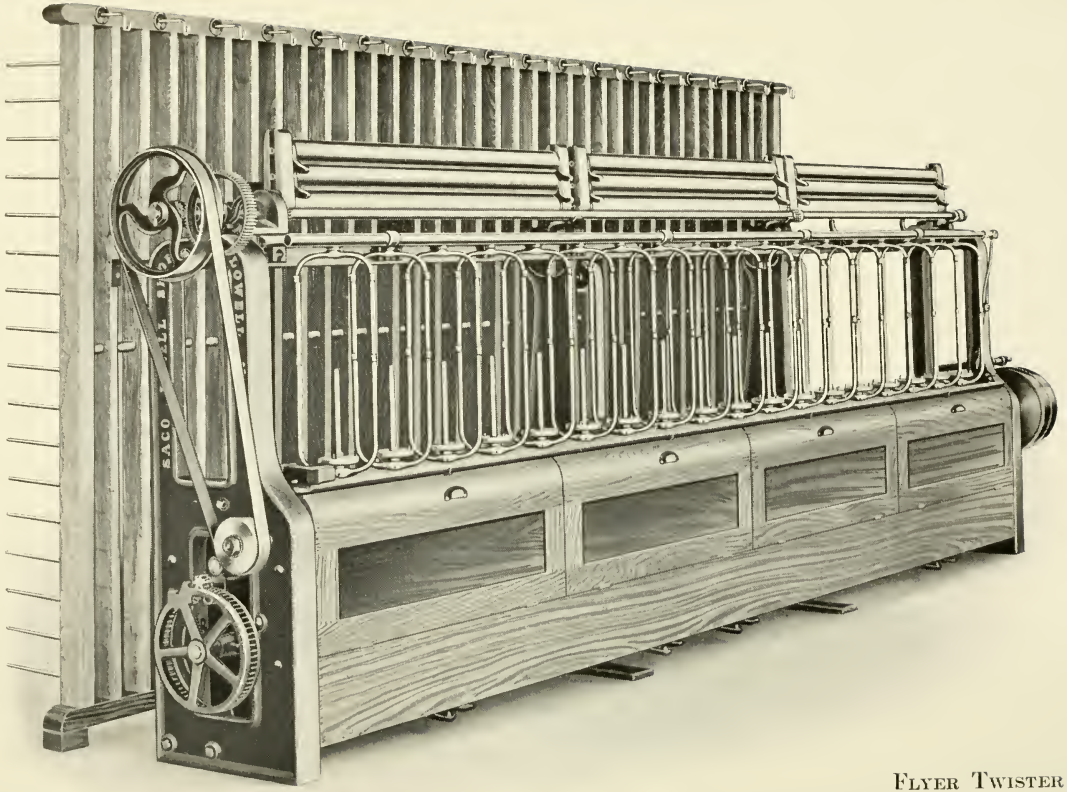
Some of the largest manufacturers of fire hose in this country use our flyer twister exclusively and one of the most prominent manufacturers of hose cords and similar products has used a number of our earliest forms of this machine for a period of over thirty years.

These machines are used for twisting from 10 to 80 ply. The creel is of wood or metal, is erected at the rear of the machine, the creel pins extend nearly to the floor and as many sections of creel are supplied as necessary. On coarse work three rolls are furnished of $2\frac{1}{2}''$ diameter. The flyer is of solid steel having a hook guide and the upper bearing is provided with a removable bronze bushing.

The traverse is effected by a mangle wheel motion. The twist changes are made by the use of twist pulleys of varying diameters which control the delivery speed. The machine has a compound for regulating the drag of the winding and a step cone for changing the speed of the traverse.

Driving pulleys are usually $13'' \times 2\frac{3}{4}''$.

We are prepared to furnish these machines with 12, 18, 24 or 30 spindles each. The lengths for the various combinations of spindles and gauge are as follows:



Flyer Twister

LENGTH OF FLYER TWISTERS

No. of Spindles	5″ Gauge 7 x 3 Bobbin ft.	in.	5¾″ Gauge 7 x 3½ Bobbin ft.	in.	7″ Gauge 8 x 5 Bobbin ft.	in.	8½″ Gauge 8 x 6 Bobbin ft.	in.	No. of Spindles
12	7	7¾	8	4	9	5¾	10	10¾	12
18	10	1¾	11	2½	12	11¾	15	1¼	18
24	12	7¾	14	1	16	5¾	19	4¼	24
30	15	1¾	16	11½	19	11¾	23	7¼	30

The width is about 24 inches without the creel. The additional width required for the creel varies from 2 to 8 feet, depending upon the ply.

We have not considered it advisable to introduce a table of production for flyer twisters as the range of ply is very great and the percentage for stoppages may vary from 10 to 50 per cent. We shall be glad to furnish estimates of production in the case of specified conditions.

Tables

ATTENTION is called to the following tables which it is hoped will be of great convenience to users of our twisters.

LENGTH TABLE FOR RING TWISTERS. We have prepared a length table for ring twisters of considerable range in spindles and gauge. It is based upon the following formulae:

For gauge from $2\frac{3}{4}''$ to $3\frac{1}{2}''$ inclusive, multiply one half the number of spindles by the gauge and add $27\frac{1}{2}''$. For gauge of $3\frac{3}{4}''$ or higher, add $26''$. The table is figured upon the two preceding formulae. In case of extra heavy tape drive twisters add $29\frac{1}{2}''$.

These formulae assume pulleys to be $3\frac{1}{4}''$ face or less. In the case of pulleys from $3\frac{3}{8}''$ to $4\frac{1}{4}''$ inclusive, add $2''$ extra.

We have shown in the table only such lengths as result from the use of rolls of the same length and of standard boss. While we prefer that frames should be ordered subject to these standard lengths, we can, when necessary, furnish frames of lengths other than those indicated in the table.

RATIO OF CYLINDER TO WHIRL. The ratio of cylinder to whirl is given in two tables, one for band whirls, the other for tape whirls. The band whirl table has been compiled with actual tests as a basis and therefore contains allowance for both slippage and for the increased diameter on which the band drives over the measured diameter. The tape whirl table contains an allowance of 5 per cent for slippage. These tables cover whirl diameters from $\frac{3}{4}''$ to $2\frac{1}{2}''$ in combination with cylinder diameters from $7''$ to $10''$ inclusive.

TWIST CHANGE GEAR TABLES. It is impracticable to provide complete twist change gear tables without greatly increasing the size of this catalogue. This is due to the fact that we manufacture twisters with four sizes of cylinder, two sizes of roll, five standard combinations of stud and cylinder gears, fourteen sizes of whirl which may be either tape or band whirls necessitating different ratios with respect to the cylinder. We have therefore provided tables giving the twist constants for the various combinations of cylinders, rolls, whirls and gearing. From these constants may be obtained the twist per inch if the change gear is known, or

the change gear if the twist is known. Only our regular combinations of cylinder and stud gears are included. The rule is as follows:

$$\frac{\text{Stud Gear} \times \text{Front Roll Gear} \times \text{Ratio of Whirl to Cylinder}}{\text{Cylinder Gear} \times \text{Cir. of Bottom Roll}} = \text{Twist Constant}$$

$$\frac{\text{Twist Constant}}{\text{Twist}} = \text{Twist Gear}$$

$$\frac{\text{Twist Constant}}{\text{Twist Gear}} = \text{Twist}$$

For Example:

Stud gear = 65 T. Cyl. gear = 50 T. Front roll gear = 91 teeth. Ratio of whirl to cylinder = 8.86. Cir. of $1\frac{1}{2}''$ roll = 4.7124.

Change gear desired for 2 ply, 10s yarn, multiplier 4.

$$\frac{65 \times 91 \times 8.86}{50 \times 4.7124} = 222.42 \quad \text{Constant}$$

$$\frac{222.42}{8.94} = 25 \quad \text{Nearest change gear.}$$

$$\frac{222.42}{25} = 8.90 \quad \text{Twist}$$

DRIVING PULLEY AND SPINDLE SPEEDS. Tables are furnished for convenience in ascertaining driving pulley and spindle speeds. They cover four sizes of cylinder, both band and tape drive, and a range of spindle speeds and whirl diameters sufficient for all practical purposes.

YARN TWIST TABLES. These tables cover a large variety of yarns from high to very low twist and from numbers 1 to 100 with their square roots. The twist indicated under each grade of yarn is such as we consider to be good practice.

TWIST TABLES FOR DIFFERENT PLY. Twist tables are supplied for 2, 3, 4, 5, 6, 8 and 10 ply yarns giving the number of twisted yarn and its square root and the twist for a range of multipliers sufficient for all practical purposes. These tables are the basis on which have been calculated our production tables more specifically referred to on page 65.

LENGTH OF RING TWISTERS

Gauge	2¾″	3″	3¼″	3½″	3¾″	4″	4½″	5″	5½″	6″	Gauge
Roll	22″	24″	19½″	21″	22½″	24″	18″	20″	22″	24″	Roll
Boss	8	8	6	6	6	6	4	4	4	4	Boss
No. of Spindles	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	No. of Spindles
64	....	....	....	....	....	....	....	15 6	16 10	18 2	64
72	....	....	....	....	....	....	15 8	17 2	18 8	20 2	72
80	....	....	....	....	....	....	17 2	18 10	20 6	22 2	80
84	....	....	....	....	15 3½	16 2	....	....	....	....	84
88	....	....	....	....	....	....	18 8	20 6	22 4	24 2	88
96	....	....	15 3½	16 3½	17 2	18 2	20 2	22 2	24 2	26 2	96
104	....	....	....	....	....	....	21 8	23 10	26 0	28 2	104
108	....	....	16 11	18 0½	19 0½	20 2	....	....	....	....	108
112	15 1½	16 3½	....	....	....	....	23 2	25 6	27 10	30 2	112
120	....	....	18 6½	19 9½	20 11	22 2	24 8	27 2	29 8	32 2	120
128	16 11½	18 3½	....	....	....	....	26 2	28 10	31 6	34 2	128
132	....	....	20 2	21 6½	22 9½	24 2	....	....	....	....	132
136	....	....	....	....	....	....	27 8	30 6	33 4	36 2	136
144	18 9½	20 3½	21 9½	23 3½	24 8	26 2	29 2	32 2	35 2	38 2	144
152	....	....	....	....	....	....	30 8	33 10	37 0	40 2	152
156	....	....	23 5	25 0½	26 6½	28 2	....	....	....	....	156
160	20 7½	22 3½	....	....	....	....	32 2	35 6	38 10	....	160
168	....	....	25 0½	26 9½	28 5	30 2	33 8	37 2	....	....	168
176	22 5½	24 3½	....	....	....	....	35 2	38 10	....	....	176
180	....	....	26 8	28 6½	30 3½	32 2	....	....	....	....	180
192	24 3½	26 3½	28 3½	30 3½	32 2	....	....	....	....	....	192
204	....	....	29 11	32 0½	....	....	....	....	....	....	204
208	26 1½	28 3½	....	....	....	....	....	....	....	....	208
224	27 11½	30 3½	....	....	....	....	....	....	....	....	224
240	29 9½	....	....	....	....	....	....	....	....	....	240

RATIO OF CYLINDER TO BAND WHIRL

Diam. of Whirl	Revs. of Whirl to One Rev. of Cylinder			
	7″ Cylinder	8″ Cylinder	9″ Cylinder	10″ Cylinder
3/4″	8.26	9.49	10.74	12.00
13/16″	7.65	8.79	9.94	11.11
7/8″	7.12	8.18	9.26	10.34
1″	6.27	7.20	8.15	9.10
1 1/8″	5.60	6.43	7.28	8.13
1 1/4″	5.07	5.82	6.59	7.36
1 5/16″	4.84	5.57	6.29	7.03
1 3/8″	4.63	5.33	6.03	6.72
1 1/2″	4.26	4.90	5.55	6.20
1 5/8″	3.97	4.55	5.15	5.75
1 3/4″	3.70	4.25	4.81	5.37
2″	3.27	3.76	4.25	4.75
2 1/4″	2.94	3.38	3.82	4.26
2 1/2″	2.67	3.07	3.47	3.88

RATIO OF CYLINDER TO TAPE WHIRL

Diam. of Whirl	Revs. of Whirl to One Rev. of Cylinder			
	7″ Cylinder	8″ Cylinder	9″ Cylinder	10″ Cylinder
3/4″	8.86	10.13	11.40	12.66
13/16″	8.19	9.36	10.53	11.69
7/8″	7.60	8.68	9.78	10.86
1″	6.65	7.60	8.55	9.50
1 1/8″	5.91	6.75	7.60	8.45
1 1/4″	5.32	6.08	6.84	7.60
1 5/16″	5.06	5.80	6.52	7.24
1 3/8″	4.84	5.53	6.22	6.91
1 1/2″	4.43	5.06	5.70	6 34
1 5/8″	4.09	4.67	5.26	5.84
1 3/4″	3.80	4.34	4.88	5.42
2″	3.33	3.80	4.28	4.75
2 1/4″	2.95	3.38	3.80	4.22
2 1/2″	2.66	3.04	3.42	3.80

TWIST CONSTANTS

BAND DRIVE. 7″ CYLINDER. 1⅜″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	226.21	326.26	493.02	659.78	826.54
13/16″	209.50	302.17	456.61	611.05	765.50
⅞″	194.99	281.23	424.98	568.72	712.46
1″	171.71	247.66	374.24	500.82	627.41
1⅛″	153.36	221.20	334.25	447.31	560.36
1¼″	138.85	200.26	302.62	404.97	507.33
1 5/16″	132.55	191.18	288.89	386.60	484.31
1⅜″	126.80	182.88	276.35	369.83	463.30
1½″	116.67	168.27	254.27	340.27	426.28
1⅝″	108.72	156.81	236.97	317.11	397.26
1¾″	101.33	146.15	220.85	295.54	370.24
2″	89.55	129.16	195.18	261.20	327.21
2¼″	80.52	116.13	175.48	234.84	294.19
2½″	73.12	105.46	159.37	213.27	267.17

TWIST CONSTANTS

BAND DRIVE. 7″ CYLINDER. 1½″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	207.36	299.75	451.94	604.79	757.66
13/16″	192.05	276.99	418.56	560.13	701.70
⅞″	178.74	257.80	389.56	521.32	653.09
1″	157.40	227.22	343.56	459.09	575.12
1⅛″	140.58	202.76	306.40	410.03	513.67
1¼″	127.28	183.57	277.40	371.22	465.05
1 5/16″	121.50	175.24	264.81	354.38	443.95
1⅜″	116.23	167.64	253.33	339.01	424.69
1½″	106.94	154.24	233.08	311.92	390.75
1⅝″	99.66	143.74	217.21	290.68	364.15
1¾″	92.79	133.97	202.44	270.91	339.39
2″	82.09	118.40	178.91	239.43	299.94
2¼″	73.81	106.45	160.87	215.27	269.67
2½″	67.03	96.67	146.09	195.50	244.91

TWIST CONSTANTS

BAND DRIVE. 8″ CYLINDER. 1⅜″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	260.14	375.20	566.97	758.75	950.52
13/16″	240.93	347.50	525.10	702.71	880.33
⅞″	224.24	323.41	488.73	654.03	819.33
1″	197.47	284.81	430.38	575.94	721.52
1⅛″	176.36	254.38	384.39	514.41	644.41
1¼″	159.68	230.30	348.01	465.72	583.43
1 5/16″	152.43	219.86	332.22	444.59	556.96
1⅜″	145.82	210.31	317.80	425.30	532.80
1½″	134.17	193.51	292.41	391.31	490.22
1⅝″	125.03	180.33	272.52	364.68	456.85
1¾″	116.53	168.07	253.98	339.87	425.78
2″	102.98	148.53	224.46	300.38	376.29
2¼″	92.60	133.55	201.80	270.07	338.32
2½″	84.09	121.28	183.28	245.26	307.25

TWIST CONSTANTS

BAND DRIVE. 8″ CYLINDER. 1½″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud. 85 T	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	238.46	344.71	519.73	695.51	871.31
13/16″	220.86	318.54	481.34	644.15	806.96
⅞″	205.55	296.47	447.99	599.52	751.05
1″	181.01	261.30	395.09	527.95	661.39
1⅛″	161.67	233.17	352.36	471.53	590.72
1¼″	146.37	211.11	319.01	426.90	534.81
1 5/16″	139.73	201.53	304.53	407.54	510.54
1⅜″	133.66	192.79	291.33	389.86	488.39
1½″	122.98	177.38	268.04	358.71	449.36
1⅝″	114.61	165.30	249.79	334.28	418.77
1¾″	106.71	154.07	232.81	311.55	390.30
2″	94.40	136.11	205.75	275.34	344.93
2¼″	84.88	122.42	185.00	247.56	310.12
2½″	77.08	111.17	168.00	224.83	281.65

TWIST CONSTANTS

BAND DRIVE. 9″ CYLINDER. 1⅜″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	294.07	424.14	640.93	857.71	1074.50
13/16″	272.35	392.82	593.59	794.37	995.15
⅞″	253.49	365.60	552.47	739.34	926.20
1″	223.22	321.96	486.51	651.07	815.63
1⅛″	199.37	287.56	434.53	581.50	728.47
1¼″	180.51	260.34	393.41	526.46	659.53
1 5/16″	172.32	248.53	375.56	502.58	629.60
1⅜″	164.84	237.74	359.26	480.78	602.29
1½″	151.67	218.75	330.55	442.35	554.16
1⅝″	141.34	203.85	308.06	412.24	516.44
1¾″	131.73	190.00	287.11	384.20	481.31
2″	116.42	167.91	253.73	339.56	425.37
2¼″	104.68	150.97	228.12	305.29	382.45
2½″	95.06	137.10	207.18	277.25	347.32

TWIST CONSTANTS

BAND DRIVE. 9″ CYLINDER. 1½″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	269.57	389.68	587.52	786.23	984.96
13/16″	249.67	360.09	545.13	728.17	912.21
⅞″	232.36	335.14	506.43	677.72	849.02
1″	204.62	295.39	446.63	596.82	747.66
1⅛″	182.75	263.59	398.32	533.04	667.77
1¼″	165.46	238.64	360.62	482.59	604.57
1 5/16″	157.95	227.81	344.25	460.69	577.14
1⅜″	151.10	217.93	329.33	440.71	552.10
1½″	139.02	200.51	303.00	405.50	507.98
1⅝″	129.56	186.86	282.37	377.88	473.40
1¾″	120.63	174.16	263.17	352.18	441.21
2″	106.72	153.92	232.58	311.26	389.92
2¼″	95.95	138.39	209.13	279.85	350.57
2½″	87.14	125.67	189.92	254.15	318.38

TWIST CONSTANTS

BAND DRIVE. 10″ CYLINDER. 1⅜″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	328.00	473.08	714.88	956.68	1198.48
13/16″	303.78	438.15	662.08	886.02	1109.98
⅞″	282.74	407.78	616.22	824.64	1033.07
1″	248.98	359.11	542.65	726.19	909.74
1 1/8″	222.37	320.74	484.66	648.60	812.52
1¼″	201.33	290.38	438.80	587.21	735.63
1 5/16″	192.20	277.21	418.89	560.57	702.25
1⅜″	183.86	265.18	400.71	536.25	671.79
1½″	169.17	243.99	368.69	493.39	618.11
1⅝″	157.64	227.37	343.61	459.81	576.03
1¾″	146.93	211.92	320.23	428.53	536.85
2″	129.85	187.28	283.01	378.74	474.45
2¼″	116.75	168.39	254.45	340.52	426.58
2½″	106.02	152.92	231.09	309.24	387.40

TWIST CONSTANTS

BAND DRIVE. 10″ CYLINDER. 1½″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	300.67	434.64	655.31	876.95	1098.61
13/16″	278.47	401.64	606.91	812.19	1017.47
⅞″	259.17	373.81	564.86	755.91	946.98
1″	228.23	329.47	498.16	665.68	833.92
1⅛″	203.84	294.00	444.28	594.54	744.82
1¼″	184.56	266.18	402.23	538.27	674.32
1 5/16″	176.18	254.10	383.97	513.85	643.73
1⅜″	168.53	243.08	367.33	491.56	615 80
1½″	155.06	223.65	337.97	452.28	566.59
1⅝″	144.51	208.42	314.95	421.49	528.02
1¾″	134.55	194.26	293.54	392.82	492.12
2″	119.03	171.68	259.42	347.17	434.91
2¼″	107.02	154.35	233.26	312.14	391.02
2½″	97.19	140.17	211.83	283.48	355.12

TWIST CONSTANTS

TAPE DRIVE. 7″ CYLINDER. 1⅜″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	242.64	349.97	528.83	707.70	886.57
13/16″	224.29	323.50	488.84	654.19	819.53
⅞″	208.13	300.19	453.63	607.88	760.49
1″	182.12	262.67	396.93	531.18	665.43
1⅛″	161.85	233.44	352.76	472.68	591.38
1¼″	145.69	210.14	317.54	424.94	532.34
1 5/16″	138.97	199.87	302.20	404.17	506.33
1⅜″	132.55	191.18	288.89	386.60	484.31
1½″	121.32	174.98	264.42	353.85	443.29
1⅝″	112.01	161.55	244.12	326.69	409.26
1¾″	104.06	150.97	226.81	303.53	380.25
2″	91.19	131.53	198.76	265.99	333.22
2¼″	80.79	116.52	176.79	235.63	295.19
2½″	72.85	105.68	158.77	212.47	266.17

TWIST CONSTANTS

TAPE DRIVE. 7″ CYLINDER. 1½″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	222.42	320.80	484.76	648.73	812.69
13/16″	205.60	296.54	448.11	599.67	751.24
⅞″	190.79	275.18	415.83	556.47	697.12
1″	166.94	240.78	363.85	486.91	609.98
1⅛″	148.79	213.99	323.36	432.73	542.10
1¼″	133.56	192.62	291.77	389.53	487.98
1 5/16″	127.03	183.21	276.85	370.49	464.13
1⅜″	121.50	175.24	264.81	354.38	443.95
1½″	111.21	160.40	242.38	324.36	406.35
1⅝″	102.68	148.89	223.78	299.47	375.16
1¾″	95.40	137.59	207.91	278.23	348.56
2″	83.60	120.57	182.20	243.82	305.45
2¼″	74.06	106.81	161.41	216.00	270.59
2½″	66.78	96.31	145.54	194.76	243.99

TWIST CONSTANTS

TAPE DRIVE. 8″ CYLINDER. 1⅜″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	277.34	400.02	604.45	808.90	1013.34
13/16″	256.36	369.76	518.50	747.74	936.72
⅞″	237.89	343.55	558.74	694.81	869.24
1″	208.16	300.23	453.69	607.14	760.59
1⅛″	184.99	266.82	403.20	540.27	675.95
1¼″	166.52	240.19	362.95	485.71	608.46
1 5/16″	158.84	228.45	345.41	461.97	578.74
1⅜″	151.50	218.52	330.20	441.88	553.57
1½″	138.67	200.00	302.23	404.45	506.68
1⅝″	128.03	184.65	279.03	373.41	467.78
1¾″	118.94	172.56	259.24	346.93	434.63
2″	104.23	150.34	227.18	304.03	380.87
2¼″	92.34	133.18	202.07	269.33	337.40
2½″	83.27	120.79	181.47	242.85	304.23

TWIST CONSTANTS

TAPE DRIVE. 8″ CYLINDER. 1½″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	254.23	366.67	554.08	741.50	928.90
13/16″	235.00	338.95	512.19	685.42	858.67
⅞″	218.07	314.53	475.29	636.05	796.81
1″	190.81	275.21	415.88	556.54	697.21
1⅛″	170.07	244.59	369.60	494.61	619.62
1¼″	152.66	220.16	333.49	445.23	557.76
1 5/16″	145.20	209.41	316.44	423.47	530.50
1⅜″	138.87	200.30	302.68	405.06	507.43
1½″	127.11	183.34	277.04	370.74	464.46
1⅝″	117.36	170.18	255.78	342.29	428.81
1¾″	109.04	157.27	237.64	318.02	398.40
2″	95.55	137.81	208.25	278.69	349.13
2¼″	84.65	122.08	184.49	246.89	309.28
2½″	76.33	110.48	166.35	222.61	278.88

TWIST CONSTANTS

TAPE DRIVE. 9″ CYLINDER. 1⅜″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	312.04	450.06	680.08	910.10	1140.13
13/16″	288.44	416.02	628.65	841.29	1053.92
⅞″	267.66	386.04	583.37	781.73	977.99
1″	234.21	337.79	510.45	683.10	855.74
1⅛″	208.14	300.20	453.65	607.87	760.51
1¼″	187.36	270.24	408.36	546.47	684.59
1 5/16″	178.72	257.03	388.63	519.76	651.14
1⅜″	170.46	245.86	371.51	497.17	622.82
1½″	156.02	225.02	340.04	455.05	570.07
1⅝″	144.04	207.75	313.94	420.12	526.31
1¾″	133.82	194.15	291.68	390.34	489.00
2″	117.27	169.15	255.61	342.06	428.52
2¼″	103.90	149.84	227.35	303.02	379.61
2½″	93.69	135.90	204.18	273.24	342.29

TWIST CONSTANTS

TAPE DRIVE. 9″ CYLINDER. 1½″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	286.03	412.55	623.40	834.27	1045.12
13/16″	264.40	381.35	576.27	771.18	966.09
⅞″	245.36	353.88	534.76	715.62	896.50
1″	214.68	309.64	467.91	626.17	784.43
1⅛″	191.34	275.19	415.84	556.49	697.14
1¼″	171.76	247.71	375.22	500.94	627.54
1 5/16″	163.36	235.61	356.03	476.45	596.87
1⅜″	156.25	225.36	340.55	455.73	570 92
1½″	143.02	206.27	311.70	417.13	522.57
1⅝″	132.05	191.47	287.78	385.12	482.46
1¾″	122.68	176.94	267.37	357.80	448.25
2″	107.51	155.05	234.31	313.55	392.81
2¼″	95.24	137.36	207.57	277.78	347.98
2½″	85.88	123.85	187.16	250.46	313.77

TWIST CONSTANTS

TAPE DRIVE. 10″ CYLINDER. 1⅜″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	346.73	500.11	755.70	1011.30	1266.91
13/16″	320.51	462.28	698.55	934.84	1171.11
⅞″	297.42	428.97	648.24	868.66	1086.74
1″	260.25	375.36	567.21	759.06	950.90
1⅛″	231.28	333.59	504.09	675.48	845.08
1¼″	208.19	300.29	453.76	607.24	760.71
1 5/16″	198.59	285.61	431.84	577.56	723.55
1⅜″	189.41	273.20	412.82	552.45	692.08
1½″	173.37	250.05	377.86	505.65	633.46
1⅝″	160.06	230.85	348.85	466.84	584.83
1¾″	148.70	215.74	324.11	433.74	543 38
2″	130.31	187.96	284.03	380.10	476.17
2¼″	115.45	166.51	252.63	336.72	421.83
2½″	104.10	151.02	226.88	303.62	380.36

TWIST CONSTANTS

TAPE DRIVE. 10″ CYLINDER. 1½″ ROLL
91 TOOTH FRONT ROLL GEAR

Whirl Diam.	Cyl. 50 T. Stud 65 T.	Cyl. 40 T. Stud 75 T.	Cyl. 30 T. Stud 85 T.	Cyl. 24 T. Stud 91 T.	Cyl. 20 T. Stud 95 T.
¾″	317.84	458.42	692.72	927.04	1161.32
13/16″	293.80	423.76	640.35	856.93	1073.52
⅞″	272.64	393.23	594.22	795.20	996.18
1″	238.56	344.07	519.94	695.79	871.66
1⅛″	212.62	305.79	462.08	618.37	774.66
1¼″	190.86	275.25	416.94	556.64	697.32
1 5/16″	181.53	261.81	395.62	529.43	663.24
1⅜″	173.62	250.42	378.41	506.41	634.40
1½″	158.92	229.21	346.36	463.51	580.67
1⅝″	146.73	212.76	319.78	427.94	536.10
1¾″	136.33	196.62	297.10	397.59	498.09
2″	119.46	172.29	260.36	348.42	436.49
2¼″	105.83	152.63	230.65	308.66	386.67
2½″	95.43	137.63	207.98	278.31	348.66

DRIVING PULLEY SPEED

7″ CYLINDER. BAND DRIVE

R. P. M. of Spindle	R. P. M. of Driving Pulley for Indicated Spindle Speeds — Diameter of Whirl													R. P. M. of Spindle
	¾″	13/16″	⅞″	1″	1⅛″	1¼″	1 5/16″	1⅜″	1½″	1⅝″	1¾″	2″	2¼″	2½″	
2500	...	...	...	...	...	...	517	540	587	630	676	765	851	937	2500
2750	...	...	...	...	...	542	568	594	646	693	743	841	936	1030	2750
3000	...	...	...	...	536	592	620	648	704	756	811	918	1021	1124	3000
3250	...	...	...	518	580	641	672	702	763	819	878	994	1106	1217	3250
3500	...	...	492	558	625	690	723	756	822	882	946	1070	1190	1311	3500
3750	...	490	527	598	670	740	775	810	881	945	1014	1147	1275	1405	3750
4000	484	523	562	638	714	789	827	864	939	1008	1081	1223	1360	1498	4000
4250	515	556	597	678	759	838	878	918	998	1071	1149	1300	1446	1592	4250
4500	545	588	632	718	804	888	930	972	1057	1134	1216	1376	1531	1685	4500
4750	575	621	667	758	848	937	981	1026	1115	1197	1284	1453	1616	....	4750
5000	605	654	702	798	893	986	1033	1080	1174	1259	1351	1529	1701	....	5000
5250	636	686	737	837	938	1036	1085	1134	1232	1322	1419	1606	....	....	5250
5500	666	719	773	877	982	1085	1136	1188	1291	1385	1487	1682	....	....	5500
5750	696	752	808	917	1027	1134	1188	1242	1350	1448	1554	....	....	....	5750
6000	726	784	843	957	1071	1184	1240	1296	1408	1511	1622	....	....	....	6000
6250	757	817	878	997	1116	1233	1291	1350	1467	1574	....	....	....	....	6250
6500	787	850	913	1037	1161	1282	1343	1404	1526	....	....	....	....	....	6500
6750	817	882	948	1077	1205	1331	1395	1458	1585	....	....	....	....	....	6750
7000	847	915	983	1116	1250	1381	1446	1512	....	....	....	....	....	....	7000
7250	878	948	1018	1156	1295	1430	1498	1566	....	....	....	....	....	....	7250
7500	908	980	1053	1196	1339	1479	1550	....	....	....	....	....	....	....	7500
7750	938	1013	1089	1236	1384	1529	1601	....	....	....	....	....	....	....	7750
8000	969	1046	1124	1276	1429	1578	....	....	....	....	....	....	....	....	8000

DRIVING PULLEY SPEED

8″ CYLINDER. BAND DRIVE

R. P. M. of Spindle	R. P. M. of Driving Pulley for Indicated Spindle Speeds. Diameter of Whirl														R. P. M. of Spindle
	¾″	13/16″	⅞″	1″	1⅛″	1¼″	1 5/16″	1⅜″	1½″	1⅝″	1¾″	2″	2¼″	2½″	
2500	...	...	...	...	...	...	449	469	510	549	588	665	740	814	2500
2750	...	...	...	...	...	473	494	516	561	604	647	731	814	896	2750
3000	...	...	...	...	467	515	539	563	612	659	706	798	888	977	3000
3250	...	...	...	451	505	558	583	610	663	714	765	864	962	1059	3250
3500	...	...	428	486	544	601	628	657	714	769	824	931	1036	1140	3500
3750	...	427	458	521	583	645	673	704	765	824	882	997	1110	1222	3750
4000	422	455	489	556	622	687	718	750	816	879	941	1064	1183	1303	4000
4250	448	484	520	590	661	730	763	797	867	934	1000	1130	1257	1384	4250
4500	474	512	550	625	700	773	808	844	918	989	1059	1197	1331	1466	4500
4750	501	540	581	660	739	816	853	891	969	1044	1118	1263	1405	1547	4750
5000	527	569	611	694	778	859	898	938	1020	1099	1176	1330	1479	1629	5000
5250	553	597	642	729	816	902	943	985	1071	1154	1235	1396	1553	1710	5250
5500	580	626	672	764	855	945	987	1032	1122	1209	1294	1463	1627	1792	5500
5750	606	654	703	799	894	988	1032	1079	1173	1264	1353	1529	1701	....	5750
6000	632	683	734	833	933	1031	1077	1126	1225	1319	1412	1596	1775	....	6000
6250	659	711	764	868	972	1074	1122	1173	1276	1374	1471	1662	....	....	6250
6500	685	740	795	903	1011	1117	1167	1220	1327	1429	1529	1729	....	....	6500
6750	711	768	825	938	1050	1160	1212	1266	1378	1484	1588	....	....	....	6750
7000	738	796	856	972	1089	1203	1257	1313	1429	1538	1647	....	....	....	7000
7250	764	825	886	1007	1128	1246	1302	1360	1480	1593	....	....	....	....	7250
7500	790	853	917	1042	1166	1289	1347	1407	1531	1648	....	....	....	....	7500
7750	817	882	947	1076	1205	1332	1391	1454	1582	....	....	....	....	....	7750
8000	843	910	978	1111	1244	1375	1436	1501	....	....	....	....	....	....	8000

DRIVING PULLEY SPEED

9″ CYLINDER. BAND DRIVE

R. P. M. of Spindle	R. P. M. of Driving Pulley for Indicated Spindle Speeds — Diameter of Whirl													R. P. M. of Spindle
	¾″	13/16″	⅞″	1″	1⅛″	1¼″	1 5/16″	1⅜″	1½″	1⅝″	1¾″	2″	2¼″	2½″	
2500	...	...	...	...	...	...	397	415	450	485	520	588	654	721	2500
2750	...	...	...	...	...	...	437	456	495	534	572	647	720	793	2750
3000	...	...	...	...	...	455	477	498	541	583	624	706	785	865	3000
3250	...	...	...	...	446	493	517	539	586	631	676	765	851	937	3250
3500	...	...	...	429	481	531	556	580	631	680	728	824	916	1009	3500
3750	...	...	...	460	515	569	596	622	676	728	780	882	982	1081	3750
4000	...	...	432	491	549	607	636	663	721	777	832	941	1047	1153	4000
4250	...	428	459	521	584	645	676	705	766	825	884	1000	1113	1225	4250
4500	419	453	486	552	618	683	715	746	811	874	936	1059	1178	1297	4500
4750	442	478	513	583	652	721	755	788	856	922	988	1118	1243	1369	4750
5000	466	503	540	613	687	759	795	829	901	971	1040	1176	1309	1441	5000
5250	489	528	567	644	721	797	835	871	946	1019	1091	1235	1374	1513	5250
5500	512	553	594	675	755	835	874	912	991	1068	1143	1294	1440	1585	5500
5750	535	578	621	706	790	873	914	954	1036	1117	1195	1353	1505	1657	5750
6000	559	604	648	736	824	910	954	995	1081	1165	1247	1412	1571	1729	6000
6250	582	629	675	767	859	948	994	1036	1126	1214	1299	1471	1636	1801	6250
6500	605	654	702	798	893	986	1033	1078	1171	1262	1351	1529	1702	....	6500
6750	629	679	729	828	927	1024	1073	1119	1216	1311	1403	1588	1767	....	6750
7000	652	704	756	859	962	1062	1113	1161	1261	1359	1455	1647	....	....	7000
7250	675	729	783	890	996	1100	1153	1202	1306	1408	1507	....	....	....	7250
7500	698	755	810	920	1030	1138	1192	1244	1351	1456	1559	....	....	....	7500
7750	722	780	837	951	1065	1176	1232	1285	1396	1505	....	....	....	....	7750
8000	745	805	864	982	1099	1214	1272	1327	1441	....	....	....	....	....	8000

DRIVING PULLEY SPEED

10″ CYLINDER. BAND DRIVE

R. P. M. of Spindle	R. P. M. of Driving Pulley for Indicated Spindle Speeds — Diameter of Whirl													R. P. M. of Spindle
	¾″	13/16″	⅞″	1″	1⅛″	1¼″	1 5/16″	1⅜″	1½″	1⅝″	1¾″	2″	2¼″	2½″	
2500	...	...	...	...	...	...	...	372	403	435	466	526	587	644	2500
2750	...	...	...	...	...	...	391	409	444	478	512	579	646	709	2750
3000	...	...	...	...	...	408	427	446	484	522	559	632	704	773	3000
3250	...	...	...	...	...	442	462	484	524	565	605	684	763	838	3250
3500	...	...	...	...	431	476	498	521	565	609	652	737	822	902	3500
3750	...	...	...	...	461	510	533	558	605	652	698	790	881	966	3750
4000	...	...	...	440	492	543	569	595	645	696	745	842	939	1031	4000
4250	...	...	...	467	523	577	605	632	685	739	791	895	998	1095	4250
4500	...	...	435	495	554	611	640	670	726	783	838	947	1057	1160	4500
4750	...	428	459	522	584	645	676	707	766	826	885	1000	1115	1224	4750
5000	417	450	484	549	615	679	711	744	806	870	931	1053	1174	1289	5000
5250	438	473	508	577	646	713	747	781	847	913	978	1105	1232	1353	5250
5500	458	496	532	604	677	747	782	818	887	957	1024	1158	1291	1418	5500
5750	479	518	556	632	707	781	818	856	927	1000	1071	1211	1350	1482	5750
6000	500	540	580	659	738	815	853	893	968	1043	1117	1263	1408	1546	6000
6250	521	563	604	687	769	849	889	930	1008	1087	1164	1316	1467	1611	6250
6500	542	585	629	714	800	883	925	967	1048	1130	1210	1368	1526	1675	6500
6750	563	608	653	742	830	917	960	1004	1089	1174	1257	1421	1585	....	6750
7000	583	630	677	769	861	951	996	1042	1129	1217	1304	1474	1643	....	7000
7250	604	653	701	797	892	985	1031	1079	1169	1261	1350	1526	....	....	7250
7500	625	675	725	824	923	1019	1067	1116	1210	1304	1397	1579	....	....	7500
7750	646	698	750	852	953	1053	1102	1153	1250	1348	1443	....	....	....	7750
8000	667	720	774	879	984	1087	1138	1190	1290	1391	....	....	....	....	8000

DRIVING PULLEY SPEED

7″ CYLINDER. TAPE DRIVE

R. P. M. of Spindle	R. P. M. of Driving Pulley for Indicated Spindle Speeds — Diameter of Whirl														R. P. M. of Spindle
	¾″	13/16″	⅞″	1″	1 1/8″	1 ¼″	1 5/16″	1 ⅜″	1 ½″	1 5/8″	1 ¾″	2″	2 ¼″	2 ½″	
2500	...	...	...	...	...	...	494	517	564	611	658	751	848	940	2500
2750	...	...	...	...	...	517	544	568	621	672	724	826	932	1034	2750
3000	...	...	...	...	508	564	593	620	677	734	790	901	1017	1128	3000
3250	...	...	...	489	550	611	642	672	734	795	855	976	1102	1222	3250
3500	...	...	461	526	592	658	692	723	790	856	921	1051	1186	1316	3500
3750	...	458	493	564	635	705	741	775	847	917	987	1126	1271	1406	3750
4000	451	488	526	602	677	752	791	827	903	978	1053	1201	1356	1504	4000
4250	480	519	559	639	719	799	840	878	959	1039	1119	1276	1441	1598	4250
4500	508	549	592	677	761	846	889	930	1016	1100	1184	1351	1525	1692	4500
4750	536	580	625	714	804	893	939	981	1072	1161	1250	1426	1610	....	4750
5000	564	611	658	752	846	940	988	1033	1129	1223	1316	1502	1695	....	5000
5250	593	641	691	790	888	987	1038	1085	1185	1284	1382	1577	....	....	5250
5500	621	672	724	827	931	1034	1087	1136	1242	1345	1447	1652	....	....	5500
5750	649	702	757	865	973	1081	1136	1188	1298	1406	1513	....	....	....	5750
6000	677	733	790	902	1015	1128	1186	1240	1354	1467	1579	....	....	....	6000
6250	705	763	822	940	1058	1175	1235	1291	1411	1528	....	....	....	....	6250
6500	734	794	855	977	1100	1222	1285	1343	1467	....	....	....	....	....	6500
6750	762	824	888	1015	1142	1269	1334	1395	1524	....	....	....	....	....	6750
7000	790	855	921	1053	1185	1316	1383	1446	....	....	....	....	....	....	7000
7250	818	885	954	1090	1227	1363	1433	1498	....	....	....	....	....	....	7250
7500	847	916	987	1128	1269	1410	1482	....	....	....	....	....	....	....	7500
7750	875	946	1020	1165	1311	1457	1532	....	....	....	....	....	....	....	7750
8000	903	977	1053	1203	1354	1504	....	....	....	....	....	....	....	....	8000

DRIVING PULLEY SPEED

8″ CYLINDER. TAPE DRIVE

R. P. M. of Spindle	R. P. M. of Driving Pulley for Indicated Spindle Speeds — Diameter of Whirl													R. P. M. of Spindle
	¾″	13/16″	7/8″	1″	1 1/8″	1 1/4″	1 5/16″	1 3/8″	1 1/2″	1 5/8″	1 3/4″	2″	2 1/4″	2 1/2″	
2500	...	...	...	...	...	...	431	452	494	535	576	658	740	823	2500
2750	...	...	...	...	...	452	474	497	544	589	634	724	814	905	2750
3000	...	...	...	...	445	494	517	543	593	643	691	790	888	987	3000
3250	...	...	...	428	482	535	560	588	642	696	749	855	962	1069	3250
3500	...	...	403	461	519	576	603	633	692	750	807	921	1036	1151	3500
3750	...	401	432	493	556	617	647	678	741	803	864	987	1110	1234	3750
4000	395	427	461	526	593	658	690	723	791	857	922	1053	1183	1316	4000
4250	420	454	490	559	630	699	733	769	840	910	979	1118	1257	1398	4250
4500	445	481	519	592	667	740	776	814	890	964	1037	1184	1331	1480	4500
4750	470	507	547	625	704	781	819	859	939	1017	1095	1250	1405	1563	4750
5000	494	534	576	658	741	822	862	904	988	1071	1152	1316	1479	1645	5000
5250	518	561	605	691	778	864	905	949	1038	1124	1210	1382	1553	1727	5250
5500	543	588	634	724	815	905	948	995	1087	1178	1267	1447	1627	1809	5500
5750	568	614	663	757	852	946	991	1040	1136	1231	1325	1513	1701	....	5750
6000	592	641	691	790	889	987	1035	1085	1186	1285	1383	1579	1775	....	6000
6250	617	668	720	822	926	1028	1078	1130	1235	1338	1440	1645	....	....	6250
6500	642	694	749	855	963	1069	1121	1175	1285	1392	1498	1711	....	....	6500
6750	667	721	778	888	1000	1110	1164	1221	1334	1445	1555	....	....	....	6750
7000	692	748	807	921	1037	1151	1207	1266	1383	1499	1613	....	....	....	7000
7250	716	775	835	954	1074	1193	1250	1311	1433	1553	....	....	....	....	7250
7500	740	801	864	987	1111	1234	1293	1356	1482	1606	....	....	....	....	7500
7750	765	828	893	1020	1148	1275	1336	1401	1532	....	....	....	....	....	7750
8000	789	855	922	1053	1185	1316	1379	1447	....	....	....	....	....	....	8000

DRIVING PULLEY SPEED

9″ CYLINDER. TAPE DRIVE

R. P. M. of Spindle	R. P. M. of Driving Pulley for Indicated Spindle Speeds — Diameter of Whirl													R. P. M. of Spindle
	3/4″	13/16″	7/8″	1″	1 1/8″	1 1/4″	1 5/16″	1 3/8″	1 1/2″	1 5/8″	1 3/4″	2″	2 1/4″	2 1/2″	
2500	...	...	...	...	...	...	383	402	439	475	512	584	658	731	2500
2750	...	...	...	...	...	...	422	442	483	523	564	643	724	804	2750
3000	...	...	...	...	...	439	460	482	526	570	615	701	790	877	3000
3250	...	...	...	...	428	475	498	523	570	618	666	760	855	950	3250
3500	...	...	...	409	461	512	537	563	614	665	717	818	921	1023	3500
3750	...	...	...	439	493	548	575	603	658	713	769	876	987	1097	3750
4000	...	...	409	468	526	585	614	643	702	761	820	935	1053	1170	4000
4250	...	404	435	497	559	621	652	683	746	808	871	993	1119	1243	4250
4500	395	428	460	526	592	658	690	724	790	856	922	1052	1184	1316	4500
4750	417	452	486	556	625	695	729	764	833	903	973	1110	1250	1389	4750
5000	439	475	511	585	658	731	767	804	877	951	1025	1168	1316	1462	5000
5250	461	499	537	614	691	768	805	844	921	998	1076	1227	1382	1535	5250
5500	483	523	562	643	724	804	844	884	965	1046	1127	1285	1447	1608	5500
5750	505	547	588	673	757	841	882	924	1009	1093	1178	1343	1513	1681	5750
6000	527	570	614	702	790	877	920	965	1053	1141	1230	1402	1579	1754	6000
6250	549	594	639	731	822	914	959	1005	1097	1189	1281	1460	1645	1828	6250
6500	571	618	665	760	855	950	997	1045	1140	1236	1332	1519	1711	....	6500
6750	592	642	690	790	888	987	1035	1085	1184	1283	1383	1577	1776	....	6750
7000	614	665	716	819	921	1023	1074	1125	1228	1331	1434	1636	....	....	7000
7250	636	689	741	848	954	1060	1112	1166	1272	1378	1486	....	....	....	7250
7500	658	713	767	877	987	1097	1150	1206	1316	1426	1537	....	....	....	7500
7750	680	737	792	906	1020	1133	1189	1246	1360	1473	....	....	....	....	7750
8000	702	760	818	936	1053	1170	1227	1286	1403	....	....	....	....	....	8000

DRIVING PULLEY SPEED

10″ CYLINDER. TAPE DRIVE

R. P. M. of Spindle	R. P. M. of Driving Pulley for Indicated Spindle Speeds — Diameter of Whirl													R. P. M. of Spindle
	¾″	13/16″	⅞″	1″	1⅛″	1¼″	1 5/16″	1⅜″	1½″	1⅝″	1¾″	2″	2¼″	2½″	
2500	...	...	...	...	...	...	...	362	394	428	462	526	593	658	2500
2750	...	...	...	...	...	...	380	398	434	471	507	579	652	724	2750
3000	...	...	...	...	...	395	414	434	473	514	554	632	711	790	3000
3250	...	...	...	...	...	428	449	470	513	557	600	684	770	855	3250
3500	...	...	...	...	414	461	483	507	552	599	646	737	829	921	3500
3750	...	...	...	...	444	493	518	543	592	642	692	790	889	987	3750
4000	...	...	...	421	473	526	553	579	631	685	738	842	948	1053	4000
4250	...	...	...	447	503	559	587	615	670	728	784	895	1007	1119	4250
4500	...	...	414	474	533	592	622	651	710	771	830	947	1066	1184	4500
4750	...	406	437	500	562	625	656	687	749	813	876	1000	1126	1250	4750
5000	395	428	460	526	592	658	691	724	789	856	923	1053	1185	1316	5000
5250	415	449	483	553	621	691	725	760	828	899	969	1105	1244	1382	5250
5500	434	470	506	579	651	724	760	796	868	942	1015	1158	1303	1447	5500
5750	454	492	529	605	681	757	794	832	907	985	1061	1211	1363	1513	5750
6000	474	513	552	632	710	790	829	868	946	1027	1107	1263	1422	1579	6000
6250	494	535	575	658	740	822	863	905	986	1070	1153	1316	1481	1645	6250
6500	513	556	598	684	769	855	898	941	1025	1113	1199	1368	1540	1711	6500
6750	533	577	621	711	799	888	932	977	1065	1156	1245	1421	1600	....	6750
7000	553	599	644	737	828	921	967	1013	1104	1199	1292	1474	1659	....	7000
7250	573	620	667	763	858	954	1002	1049	1143	1242	1338	1526	....	....	7250
7500	592	642	690	789	888	987	1036	1085	1183	1284	1384	1579	....	....	7500
7750	612	663	714	816	917	1020	1070	1122	1222	1327	1430	....	....	....	7750
8000	632	684	737	842	947	1053	1105	1158	1262	1370	....	....	....	....	8000

YARN TWIST TABLES

Counts or Numbers	Square Root	High Warp Twist	Medium Warp Twist	Low Warp Twist	High Mule Twist	Mule Twist	Counts or Numbers
1	1.0000	5.00	4.75	4.50	4.00	3.75	1
2	1.4142	7.07	6.72	6.36	5.66	5.30	2
3	1.7321	8.66	8.23	7.79	6.93	6.50	3
4	2.0000	10.00	9.50	9.00	8.00	7.50	4
5	2.2361	11.18	10.62	10.06	8.94	8.39	5
6	2.4495	12.25	11.64	11.02	9.80	9.19	6
7	2.6458	13.23	12.57	11.91	10.58	9.92	7
8	2.8284	14.14	13.43	12.73	11.31	10.61	8
9	3.0000	15.00	14.25	13.50	12.00	11.25	9
10	3.1623	15.81	15.02	14.30	12.65	11.86	10
11	3.3166	16.58	15.75	14.92	13.27	12.44	11
12	3.4641	17.32	16.45	15 59	13.86	12.99	12
13	3.6056	18.03	17.13	16.23	14.42	13.52	13
14	3.7417	18.71	17.77	16.84	14.97	14.03	14
15	3.8730	19.36	18.40	17.43	15.49	14.52	15
16	4.0000	20.00	19.00	18.00	16.00	15.00	16
17	4.1231	20.62	19.58	18.55	16.49	15.46	17
18	4.2426	21.21	20.15	19.09	16.97	15.91	18
19	4.3589	21.79	20.70	19.61	17.44	16.35	19
20	4.4721	22.36	21.24	20.12	17.89	16.77	20
21	4.5826	22.91	21.77	20.62	18.33	17.18	21
22	4.6904	23.45	22.28	21.11	18.76	17.59	22
23	4.7958	23.98	22.78	21.58	19.18	17.98	23
24	4.8990	24.49	23.27	22.05	19.60	18.37	24
25	5.0000	25.00	23.75	22.50	20.00	18.75	25
26	5.0990	25.50	24.22	22.95	20.40	19.12	26
27	5.1962	25.98	24.68	23.38	20.78	19.49	27
28	5.2915	26.46	25.13	23.81	21.17	19.84	28
29	5.3852	26.93	25.58	24.23	21.54	20.19	29
30	5.4772	27.39	26.02	24.65	21.91	20.54	30
31	5.5678	27.84	26.45	25.04	22.27	20.88	31
32	5.6569	28.28	26.87	25.46	22.63	21.21	32
33	5.7446	28.72	27.29	25.85	22.98	21.54	33
34	5.8310	29.15	27.70	26.24	23.32	21.87	34
35	5.9169	29.58	28.10	26.62	23.66	22.19	35
36	6.0000	30.00	28.50	27.00	24.00	22.50	36
37	6.0828	30.41	28.89	27.37	24.33	22.81	37
38	6.1644	30.82	29.28	27.74	24.66	23.12	38
39	6.2450	31.22	29.66	28.10	24.98	23.42	39
40	6.3246	31.62	30.04	28.46	25.30	23.72	40
41	6.4031	32.02	30.41	28.81	25.61	24.01	41
42	6.4807	32.40	30.78	29.16	25.92	24.30	42
43	6.5574	32.79	31.15	29.51	26.23	24.59	43
44	6.6332	33.17	31.51	29.85	26.53	24.87	44
45	6.7082	33.54	31.86	30.19	26.83	25.16	45
46	6.7823	33.91	32.21	30.52	27.13	25.43	46
47	6.8557	34.28	32.56	30.85	27.42	25.71	47
48	6.9282	34.64	32.91	31.18	27.71	25.98	48
49	7.0000	35.00	33.25	31.50	28.00	26.25	49
50	7.0711	35.36	33.59	31.82	28.28	26.52	50

YARN TWIST TABLES

(Continued)

Counts or Numbers	Square Root	High Filling Twist	Medium Filling Twist	Low Filling Twist	Soft Hosiery Twist	Very Low Twist	Counts or Numbers
1	1.0000	3.50	3.25	3.00	2.75	2.50	1
2	1.4142	4.95	4.60	4.24	3.89	3.54	2
3	1.7321	6.06	5.63	5.20	4.76	4.33	3
4	2.0000	7.00	6.50	6.00	5.50	5.00	4
5	2.2361	7.83	7.27	6.71	6.15	5.59	5
6	2.4495	8.57	7.96	7.35	6.74	6.12	6
7	2.6458	9.26	8.60	7.94	7.28	6.61	7
8	2.8284	9.90	9.19	8.48	7.78	7.07	8
9	3.0000	10.50	9.75	9.00	8.25	7.50	9
10	3.1623	11.07	10.28	9.49	8.70	7.91	10
11	3.3166	11.61	10.78	9.95	9.12	8.29	11
12	3.4641	12.12	11.26	10.39	9.53	8.66	12
13	3.6056	12.62	11.72	10.82	9.92	9.01	13
14	3.7417	13.10	12.16	11.22	10.29	9.35	14
15	3.8730	13.56	12.59	11.62	10.65	9.68	15
16	4.0000	14.00	13.00	12.00	11.00	10.00	16
17	4.1231	14.43	13.40	12.37	11.34	10.31	17
18	4.2426	14.85	13.79	12.73	11.67	10.61	18
19	4.3589	15.26	14.17	13.07	11.99	10.90	19
20	4.4721	15.65	14.53	13.41	12.30	11.18	20
21	4.5826	16.04	14.89	13.75	12.60	11.46	21
22	4.6904	16.42	15.24	14.07	12.90	11.73	22
23	4.7958	16.79	15.59	14.39	13.19	11.99	23
24	4.8990	17.15	15.92	14.70	13.47	12.25	24
25	5.0000	17.50	16.25	15.00	13.75	12.50	25
26	5.0990	17.85	16.57	15.30	14.02	12.75	26
27	5.1962	18.19	16.89	15.59	14.29	12.99	27
28	5.2915	18.52	17.20	15.87	14.55	13.23	28
29	5.3852	18.85	17.50	16.15	14.81	13.46	29
30	5.4772	19.17	17.80	16.43	15.06	13.69	30
31	5.5678	19.49	18.10	16.70	15.31	13.92	31
32	5.6569	19.80	18.38	16.97	15.56	14.14	32
33	5.7446	20.11	18.67	17.23	15.80	14.36	33
34	5.8310	20.41	18.95	17.49	16.03	14.58	34
35	5.9161	20.71	19.23	17.75	16.27	14.79	35
36	6.0000	21.00	19.50	18.00	16.50	15.00	36
37	6.0828	21.29	19.77	18.25	16.73	15.21	37
38	6.1644	21.58	20.03	18.49	16.95	15.41	38
39	6.2450	21.86	20.30	18.73	17.17	15 61	29
40	6.3246	22.14	20.55	18.97	17.39	15.81	40
41	6.4031	22.41	20.81	19.21	17.61	16.01	41
42	6.4807	22.68	21.06	19.44	17.82	16.20	42
43	6.5574	22.95	21.31	19.67	18.03	16.39	43
44	6.6332	23.22	21.56	19.90	18.24	16.58	44
45	6.7082	23.48	21.80	20.12	18.45	16.77	45
46	6.7823	23.74	22.04	20.35	18.65	16.96	46
47	6.8557	23.99	22.28	20.57	18.85	17.14	47
48	6.9282	24.25	22.52	20.78	19.05	17.32	48
49	7.0000	24.50	22.75	21.00	19.25	17.50	49
50	7.0711	24.75	22.98	21.21	19.45	17.68	50

YARN TWIST TABLES

(Continued)

Counts or Numbers	Square Root	High Warp Twist	Medium Warp Twist	Low Warp Twist	High Mule Twist	Mule Twist	Counts or Numbers
1	1.0000	5.00	4.75	4.50	4.00	3.75	1
51	7.1414	35.71	33.92	32.14	28.57	26.78	51
52	7.2111	36.06	34.25	32.45	28.84	27.04	52
53	7.2801	36.40	34.58	32.76	29.12	27.30	53
54	7.3485	36.74	34.90	33.07	29.39	27.56	54
55	7.4162	37.08	35.23	33.37	29.66	27.81	55
56	7.4833	37.42	35.55	33.67	29.93	28.06	56
57	7.5498	37.75	35.86	33.97	30.20	28.31	57
58	7.6158	38.08	36.17	34.27	30.46	28.56	58
59	7.6811	38.41	36.49	34.56	30.72	28.80	59
60	7.7460	38.73	36.79	34.86	30.98	29.05	60
61	7.8102	39.05	37.10	35.15	31.24	29.29	61
62	7.8740	39.37	37.40	35.43	31.50	29.53	62
63	7.9373	39.69	37.70	35.72	31.75	29.76	63
64	8.0000	40.00	38.00	36.00	32.00	30.00	64
65	8.0623	40.31	38.30	36.28	32.25	30.23	65
66	8.1240	40.62	38.59	36.56	32.50	30.47	66
67	8.1854	40.93	38.88	36.83	32.74	30.69	67
68	8.2462	41.23	39.17	37.11	32.98	30.92	68
69	8.3066	41.53	39.46	37.38	33.23	31.15	69
70	8.3666	41.83	39.74	37.65	33.47	31.37	70
71	8.4261	42.13	40.02	37.92	33.70	31.60	71
72	8.4853	42.43	40.30	38.18	33.94	31.82	72
73	8.5440	42.72	40.58	38.45	34.18	32.04	73
74	8.6023	43.01	40.86	38.71	34.41	32.26	74
75	8.6603	43.30	41.14	38.97	34.64	32.48	75
76	8.7178	43.59	41.41	39.23	34.87	32.69	76
77	8.7750	43.85	41.68	39.49	35.10	32.91	77
78	8.8318	44.15	41.95	39.74	35.33	33.12	78
79	8.8882	44.44	42.22	40.00	35.55	33.33	79
80	8.9443	44.72	42.48	40.25	35.78	33.54	80
81	9.0000	45.00	42.75	40.50	36.00	33.75	81
82	9.0554	45.28	43.01	40.75	36.22	33.96	82
83	9.1104	45.55	43.27	41.00	36.44	34.16	83
84	9.1652	45.83	43.53	41.24	36.66	34.37	84
85	9.2195	46.10	43.79	41.49	36.88	34.57	85
86	9.2736	46.37	44.05	41.73	37.09	34.78	86
87	9.3274	46.64	44.31	41.97	37.31	34.98	87
88	9.3808	46.90	44.56	42.21	37.52	35.18	88
89	9.4340	47.17	44.81	42.45	37.74	35.38	89
90	9.4868	47.43	45.06	42.69	37.95	35.58	90
91	9.5394	47.70	45.31	42.93	38.16	35.77	91
92	9.5917	47.96	45.56	43.16	38.37	35 97	92
93	9.6437	48.22	45.81	43.40	38.57	36 16	93
94	9.6954	48.48	46.05	43.63	38.78	36 36	94
95	9.7468	48.73	46.30	43.86	38.99	36.55	95
96	9.7980	48.99	46.54	44.09	39.19	36.74	96
97	9.8489	49.24	46.78	44.32	39.40	36.93	97
98	9.8995	49.50	47.02	44.55	39.60	37.12	98
99	9.9499	49.75	47.26	44.77	39.80	37.31	99
100	10.0000	50.00	47.50	45.00	40.00	37.50	100

YARN TWIST TABLES

(Continued)

Counts or Numbers	Square Root	High Filling Twist	Medium Filling Twist	Low Filling Twist	Soft Hosiery Twist	Very Low Twist	Counts or Numbers
1	1.0000	3.50	3.25	3.00	2.75	2.50	1
51	7.1414	24.99	23.21	21.42	19.64	17.85	51
52	7.2111	25.24	23.44	21.63	19.83	18.03	52
53	7.2801	25.48	23.66	21.84	20.02	18.20	53
54	7.3485	25.72	23.88	22.04	20.21	18.37	54
55	7.4162	25.96	24.10	22.25	20.39	18.54	55
56	7.4833	26.19	24.32	22.45	20.58	18.71	56
57	7.5498	26.42	24.54	22.65	20.76	18.87	57
58	7.6158	26.66	24.75	22.85	20.94	19.04	58
59	7.6811	26.88	24.96	23.04	21.12	19.20	59
60	7.7460	27.11	25.17	23.24	21.30	19.36	60
61	7.8102	27.34	25.38	23.43	21.48	19.53	61
62	7.8740	27.56	25.59	23.62	21.65	19.68	62
63	7.9373	27.78	25.80	23.81	21.83	19.84	63
64	8.0000	28.00	26.00	24.00	22.00	20.00	64
65	8.0623	28.22	26.20	24.19	22.17	20.16	65
66	8.1240	28.43	26.40	24.37	22.34	20.31	66
67	8.1854	28.65	26.60	24.55	22.51	20.46	67
68	8.2462	28.86	26.80	24.74	22.68	20.62	68
69	8.3066	29.07	27.00	24.92	22.84	20.77	69
70	8.3666	29.28	27.19	25.10	23.01	20.92	70
71	8.4261	29.49	27.38	25.28	23.17	21.07	71
72	8.4853	29.70	27.58	25.45	23.23	21.21	72
73	8.5440	29.90	27.77	25.63	23.50	21.36	73
74	8.6023	30.11	27.96	25.81	23.66	21.51	74
75	8.6603	30.31	28.15	25.98	23.82	21.65	75
76	8.7178	30.51	28.33	26.15	23.97	21.79	76
77	8.7750	30.71	28.52	26.32	24.13	21.94	77
78	8.8318	30.91	28.70	26.49	24.29	22.08	78
79	8.8882	31.11	28.87	26.66	24.44	22.22	79
80	8.9443	31.30	29.07	26.83	24.60	22.36	80
81	9.0000	31.50	29.25	27.00	24.75	22.50	81
82	9.0554	31.69	29.43	27.16	24.90	22.64	82
83	9.1104	31.89	29.61	27.33	25.05	22.78	83
84	9.1652	32.08	29.79	27.49	25.20	22.91	84
85	9.2195	32.27	29.96	27.66	25.35	23.05	85
86	9.2736	32.46	30.14	27.82	25.50	23.18	86
87	9.3274	32.65	30.31	27.98	25.65	23.32	87
88	9.3808	32.83	30.49	28.14	25.80	23.45	88
89	9.4340	33.02	30.66	28.30	25.94	23.59	89
90	9.4868	33.20	30.83	28.46	26.09	23.72	90
91	9.5394	33.39	31.00	28.62	26.23	23.85	91
92	9.5917	33.57	31.17	28.77	26.38	23.98	92
93	9.6437	33.75	31.34	28.93	26.52	24.11	93
94	9.6954	33.93	31.51	29.09	26.66	24.24	94
95	9.7468	34.11	31.68	29.24	26.80	24.37	95
96	9.7980	34.29	31.84	29.39	26.94	24.50	96
97	9.8489	34.47	32.01	29.55	27.08	24.62	97
98	9.8995	34.65	32.17	29.70	27.22	24.75	98
99	9.9499	34.82	32.34	29.85	27.36	24.87	99
100	10.0000	35.00	32.50	30.00	27.50	25.00	100

TWIST TABLES, TWO PLY

No. of Yarn to be Twisted	No. of Twisted Yarn	Sq. Root of No. of Twisted Yarn	Twist in One Inch				
			Square Root Multiplied by				
			3	4	5	6	7
1	.5	.7071	2.12	2.83	3.54	4.24	4.95
2	1.0	1.0000	3.00	4.00	5.00	6.00	7.00
3	1.5	1.2247	3.68	4.90	6.12	7.35	8.58
4	2.0	1.4142	4.24	5.66	7.07	8.49	9.90
5	2.5	1.5811	4.74	6.32	7.91	9.49	11.07
6	3.0	1.7321	5.20	6.93	8.66	10.39	12.12
7	3.5	1.8708	5.61	7.48	9.35	11.22	13.10
8	4.0	2.0000	6.00	8.00	10.00	12.00	14.00
9	4.5	2.1213	6.36	8.49	10.61	12.73	14.85
10	5.0	2.2361	6.71	8.94	11.18	13.42	15.65
11	5.5	2.3452	7.04	9.38	11.73	14.07	16.42
12	6.0	2.4495	7.35	9.80	12.25	14.70	17.15
13	6.5	2.5495	7.65	10.20	12.75	15.30	17.85
14	7.0	2.6458	7.94	10.58	13.23	15.87	18.52
15	7.5	2.7386	8.22	10.95	13.69	16.43	19.17
16	8.0	2.8284	8.48	11.31	14.14	16.97	19.80
17	8.5	2.9155	8.75	11.66	14.58	17.49	20.41
18	9.0	3.0000	9.00	12.00	15.00	18.00	21.00
19	9.5	3.0822	9.25	12.33	15.41	18.49	21.57
20	10.0	3.1623	9.49	12.65	15.81	18.97	22.13
21	10.5	3.2404	9.72	12.96	16.20	19.44	22.68
22	11.0	3.3166	9.95	13.27	16.58	19.90	23.22
23	11.5	3.3912	10.17	13.56	16.96	20.35	23.74
24	12.0	3.4641	10.39	13.86	17.32	20.78	24.25
25	12.5	3.5355	10.61	14.14	17.68	21.21	24.75
26	13.0	3.6056	10.82	14.42	18.03	21.63	25.24
27	13.5	3.6742	11.02	14.70	18.37	22.05	25.72
28	14.0	3.7417	11.23	14.97	18.71	22.45	26.19
29	14.5	3.8079	11.42	15.23	19.04	22.85	26.66
30	15.0	3.8730	11.62	15.49	19.37	23.24	27.11
31	15.5	3.9370	11.81	15.75	19.69	23.62	27.56
32	16.0	4.0000	12.00	16.00	20.00	24.00	28.00
33	16.5	4.0620	12.19	16.25	20.31	24.37	28.43
34	17.0	4.1231	12.37	16.49	20.62	24.74	28.86
35	17.5	4.1833	12.55	16.73	20.92	25.10	29.28
36	18.0	4.2426	12.73	16.97	21.21	25.46	29.70
37	18.5	4.3012	12.90	17.20	21.51	25.81	30.11
38	19.0	4.3589	13.08	17.44	21.79	26.15	30.51
39	19.5	4.4159	13.25	17.66	22.08	26.50	30.91
40	20.0	4.4721	13.42	17.89	22.36	26.83	31.30
41	20.5	4.5277	13.58	18.11	22.64	27.17	31.70
42	21.0	4.5826	13.75	18.33	22.91	27.50	32.08
43	21.5	4.6368	13.91	18.55	23.18	27.82	32.46
44	22.0	4.6904	14.07	18.76	23.45	28.14	32.83
45	22.5	4.7434	14.23	18.97	23.72	28.46	33.20
46	23.0	4.7958	14.39	19.18	23.98	28.77	33.57
47	23.5	4.8477	14.54	19.39	24.24	29.09	33.94
48	24.0	4.8990	14.70	19.60	24.49	29.39	34.29
49	24.5	4.9497	14.85	19.80	24.75	29.70	34.65
50	25.0	5.0000	15.00	20.00	25.00	30.00	35.00

TWIST TABLES, TWO PLY

No. of Yarn to be Twisted	No. of Twisted Yarn	Sq. Root of No. of Twisted Yarn	Twist in One Inch — Square Root Multiplied by				
			3	4	5	6	7
51	25.5	5.0498	15.15	20.20	25.25	30.30	35.35
52	26.0	5.0990	15.30	20.40	25.50	30.59	35.69
53	26.5	5.1478	15.44	20.59	25.74	30.89	36.04
54	27.0	5.1962	15.59	20.78	25.98	31.18	36.37
55	27.5	5.2440	15.73	20.98	26.22	31.46	36.71
56	28.0	5.2915	15.88	21.17	26.46	31.75	37.04
57	28.5	5.3385	16.02	21.35	26.69	32.03	37.37
58	29.0	5.3852	16.16	21.54	26.93	32.31	37.70
59	29.5	5.4314	16.29	21.73	27.16	32.59	38.02
60	30.0	5.4772	16.43	21.91	27.39	32.86	38.34
61	30.5	5.5227	16.57	22.09	27.61	33.14	38.66
62	31.0	5.5678	16.70	22.27	27.84	33.41	38.98
63	31.5	5.6125	16.84	22.45	28.06	33.67	39.29
64	32.0	5.6569	16.97	22.63	28.28	33.94	39.60
65	32.5	5.7009	17.10	22.80	28.50	34.21	39.91
66	33.0	5.7446	17.24	22.98	28.72	34.47	40.22
67	33.5	5.7879	17.36	23.15	28.94	34.73	40.52
68	34.0	5.8310	17.49	23.32	29.15	34.99	40.82
69	34.5	5.8737	17.62	23.49	29.37	35.24	41.12
70	35.0	5.9161	17.75	23.66	29.58	35.50	41.41
71	35.5	5.9582	17.77	23.83	29.79	35.75	41.71
72	36.0	6.0000	18.00	24.00	30.00	36.00	42.00
73	36.5	6.0415	18.13	24.17	30.21	36.25	42.29
74	37.0	6.0828	18.25	24.33	30.41	36.50	42.58
75	37.5	6.1237	18.37	24.49	30.62	36.74	42.87
76	38.0	6.1644	....	24.66	30.82	36.99	43.15
77	38.5	6.2049	....	24.82	31.02	37.23	43.44
78	39.0	6.2450	....	24.98	31.22	37.47	43.72
79	39.5	6.2849	....	25.14	31.42	37.71	44.00
80	40.0	6.3246	....	25.30	31.62	37.95	44.28
81	40.5	6.3640	....	25.46	31.82	38.18	44.55
82	41.0	6.4031	....	25.61	32.02	38.42	44.82
83	41.5	6.4420	....	25.77	32.21	38.65	45.09
84	42.0	6.4807	....	25.92	32.40	38.88	45.37
85	42.5	6.5192	....	26.08	32.60	39.12	45.63
86	43.0	6.5574	....	26.23	32.79	39.34	45.90
87	43.5	6.5955	....	26.38	32.98	39.57	46.17
88	44.0	6.6332	....	26.53	33.17	39.80	46.43
89	44.5	6.6708	....	26.68	33.35	40.02	46.70
90	45.0	6.7082	....	26.83	33.54	40.25	46.96
91	45.5	6.7454	....	26.98	33.73	40.47	47.22
92	46.0	6.7823	....	27.13	33.91	40.69	47.47
93	46.5	6.8191	....	27.28	34.10	40.91	47.73
94	47.0	6.8557	....	27.42	34.28	41.13	47.99
95	47.5	6.8920	....	27.57	34.46	41.35	48.24
96	48.0	6.9282	....	27.71	34.64	41.57	48.50
97	48.5	6.9642	....	27.86	34.82	41.79	48.75
98	49.0	7.0000	....	28.00	35.00	42.00	49.00
99	49.5	7.0356	....	28.14	35.18	42.21	49.25
100	50.0	7.0711	....	28.28	35.36	42.43	49.50

TWIST TABLES, THREE PLY

No. of Yarn to be Twisted	No. of Twisted Yarn	Sq. Root of No. of Twisted Yarn	Twist in One Inch				
			Square Root Multiplied by				
			3	4	5	6	7
1	.33	.5774	1.73	2.31	2.89	3.46	4.04
2	.67	.8165	2.45	3.27	4.08	4.90	5.72
3	1.00	1.0000	3.00	4.00	5.00	6.00	7.00
4	1.33	1.1547	3.47	4.62	5.77	6.93	8.09
5	1.67	1.2910	3.87	5.16	6.45	7.75	9.04
6	2.00	1.4142	4.24	5.66	7.07	8.49	9.90
7	2.33	1.5275	4.58	6.11	7.64	9.17	10.70
8	2.67	1.6330	4.90	6.53	8.16	9.80	11.43
9	3.00	1.7321	5.20	6.93	8.66	10.39	12.12
10	3.33	1.8257	5.48	7.30	9.13	10.95	12.78
11	3.67	1.9149	5.75	7.66	9.57	11.49	13.41
12	4.00	2.0000	6.00	8.00	10.00	12.00	14.00
13	4.33	2.0817	6.25	8.33	10.41	12.49	14.57
14	4.67	2.1602	6.48	8.64	10.80	12.96	15.12
15	5.00	2.2361	6.71	8.94	11.18	13.42	15.65
16	5.33	2.3094	6.93	9.24	11.55	13.86	16.16
17	5.67	2.3805	7.14	9.52	11.90	14.28	16.66
18	6.00	2.4495	7.35	9.80	12.25	14.70	17.14
19	6.33	2.5166	7.55	10.07	12.58	15.10	17.62
20	6.67	2.5820	7.75	10.33	12.91	15.49	18.07
21	7.00	2.6458	7.94	10.58	13.23	15.87	18.52
22	7.33	2.7080	8.12	10.83	13.54	16.25	18.96
23	7.67	2.7689	8.31	11.08	13.84	16.61	19.38
24	8.00	2.8284	8.48	11.31	14.14	16.97	19.80
25	8.33	2.8868	8.66	11.55	14.43	17.32	20.21
26	8.67	2.9439	8.83	11.76	14.72	17 66	20.61
27	9.00	3.0000	9.00	12.00	15.00	18.00	21.00
28	9.33	3.0551	9.17	12.22	15.28	18.33	21.39
29	9.67	3.1091	9.33	12.44	15.55	18.65	21.76
30	10.00	3.1623	9.49	12.65	15.81	18.97	22.13
31	10.33	3.2145	9.65	12.86	16.07	19.29	22.51
32	10.67	3.2659	9.80	13.06	16.33	19.60	22.86
33	11.00	3.3166	9.95	13.27	16.58	19.90	23.22
34	11.33	3.3665	10.10	13.47	16.83	20.20	23.57
35	11 67	3.4157	10.25	13.66	17.08	20.49	23.91
36	12 00	3.4641	10.39	13.86	17.32	20.78	24.25
37	12.33	3.5119	10.54	14.05	17.56	21.07	24.58
38	12.67	3.5590	10.68	14.24	17.80	21.35	24.91
39	13.00	3.6056	10.82	14.42	18.03	21.63	25.24
40	13.33	3.6515	10.96	14.61	18.26	21.91	25.56
41	13.67	3.6969	11.09	14.79	18.48	22.18	25.88
42	14.00	3.7417	11.23	14.97	18.71	22.45	26.19
43	14.33	3.7859	11.36	15.14	18.93	22.72	26.50
44	14.67	3.8297	11.49	15.32	19.15	22.98	26.81
45	15.00	3.8730	11.62	15.49	19.36	23.24	27.11
46	15.33	3.9158	11.75	15.66	19.58	23.49	27.41
47	15.67	3.9582	11.87	15.83	19.79	23.75	27.71
48	16.00	4.0000	12.00	16.00	20.00	24.00	28.00
49	16.33	4.0415	12.13	16.17	20.21	24.25	28.29
50	16.67	4.0825	12.25	16.33	20.41	24.49	28.58

TWIST TABLES, THREE PLY

No. of Yarn to be Twisted	No. of Twisted Yarn	Sq. Root of No. of Twisted Yarn	Twist in One Inch				
			Square Root Multiplied by				
			3	4	5	6	7
51	17.00	4.1231	12.37	16.49	20.62	24.74	28.86
52	17.33	4.1633	12.49	16.65	20.82	24.98	29.14
53	17.67	4.2032	12.61	16.81	21.02	25.22	29.42
54	18.00	4.2426	12.73	16.97	21.21	25.46	29.70
55	18.33	4.2817	12.85	17.13	21.41	25.69	29.97
56	18.67	4.3205	12.96	17.28	21.60	25.92	30.25
57	19.00	4.3589	13.08	17.44	21.79	26.15	30.51
58	19.33	4.3970	13.19	17.59	21.98	26.38	30.78
59	19.67	4.4347	13.31	17.74	22.17	26.61	31.05
60	20.00	4.4721	13.42	17.89	22.36	26.83	31.30
61	20.33	4.5092	13.53	18.04	22.55	27.06	31.56
62	20.67	4.5461	13.64	18.18	22.73	27.28	31.82
63	21.00	4.5826	13.75	18.33	22.91	27.50	32.08
64	21.33	4.6188	13.86	18.48	23.09	27.71	32.33
65	21.67	4.6547	13.97	18.62	23.27	27.93	32.59
66	22.00	4.6904	14.07	18.76	23.45	28.14	32.83
67	22.33	4.7258	14.18	18.90	23.63	28.35	33.08
68	22.67	4.7610	14.28	19.04	23.80	28.57	33.33
69	23.00	4.7958	14.39	19.18	23.98	28.77	33.57
70	23.33	4.8305	14.49	19.32	24.15	28.98	33.82
71	23.67	4.8648	14.60	19.46	24.32	29.19	34.06
72	24.00	4.8990	14.70	19.60	24.49	29.39	34.29
73	24.33	4.9329	14.80	19.73	24.66	29.60	34.53
74	24.67	4.9666	14.90	19.87	24.83	29.80	34.77
75	25.00	5.0000	15.00	20.00	25.00	30.00	35.00
76	25.33	5.0332	....	20.13	25.17	30.20	35.23
77	25.67	5.0662	....	20.26	25.33	30.40	35.46
78	26.00	5.0990	....	20.40	25.50	30.59	35.69
79	26.33	5.1316	....	20.53	25.66	30.79	35.92
80	26.67	5.1640	....	20.66	25.82	30.98	36.15
81	27.00	5.1962	....	20.78	25.98	31.18	36.37
82	27.33	5.2281	....	20.91	26.14	31.37	36.60
83	27.67	5.2599	....	21.04	26.30	31.56	36.82
84	28.00	5.2915	....	21.17	26.46	31.75	37.04
85	28.33	5.3229	....	21.29	26.61	31.94	37.26
86	28.67	5.3541	....	21.42	26.77	32.12	37.48
87	29.00	5.3852	....	21.54	26.93	32.31	37.70
88	29.33	5.4160	....	21.66	27.08	32.50	37.91
89	29.67	5.4467	....	21.79	27.23	32.68	38.13
90	30.00	5.4772	....	21.91	27.39	32.86	38.34
91	30.33	5.5076	....	22.03	27.54	33.05	38.56
92	30.67	5.5377	....	22.15	27.69	33.23	38.77
93	31.00	5.5678	....	22.27	27.84	33.41	38.98
94	31.33	5.5976	....	22.39	27.99	33.59	39.19
95	31.67	5.6273	....	22.51	28.14	33.76	39.39
96	32.00	5.6569	....	22.63	28.28	33.94	39.60
97	32.33	5.6862	....	22.74	28.43	34.12	39.80
98	32.67	5.7155	....	22.86	28.58	34.29	40.01
99	33.00	5.7446	....	22.98	28.72	34.47	40.22
100	33.33	5.7735	....	23.10	28.87	34.64	40.42

TWIST TABLES, FOUR PLY

No. of Yarn to be Twisted	No. of Twisted Yarn	Sq. Root of No. of Twisted Yarn	Twist in One Inch				
			Square Root Multiplied by				
			3	4	5	6	7
1	.25	.5000	1.50	2.00	2.50	3.00	3.50
2	.50	.7071	2.12	2.83	3.54	4.24	4.95
3	.75	.8660	2.60	3.46	4.33	5.20	6.06
4	1.00	1.0000	3.00	4.00	5.00	6.00	7.00
5	1.25	1.1180	3.35	4.47	5.59	6.71	7.83
6	1.50	1.2247	3.68	4.90	6.12	7.35	8.58
7	1.75	1.3229	3.97	5.29	6.61	7.94	9.26
8	2.00	1.4142	4.24	5.66	7.07	8.49	9.90
9	2.25	1.5000	4.50	6.00	7.50	9.00	10.50
10	2.50	1.5811	4.74	6.32	7.91	9.49	11.07
11	2.75	1.6583	4.97	6.63	8.29	9.95	11.61
12	3.00	1.7321	5.20	6.93	8.66	10.39	12.12
13	3.25	1.8028	5.41	7.21	9.01	10.82	12.62
14	3.50	1.8708	5.61	7.48	9.35	11.22	13.10
15	3.75	1.9365	5.81	7.75	9.68	11.62	13.55
16	4.00	2.0000	6.00	8.00	10.00	12.00	14.00
17	4.25	2.0616	6.19	8.25	10.31	12.37	14.43
18	4.50	2.1213	6.36	8.49	10.61	12.73	14.85
19	4.75	2.1794	6.54	8.72	10.90	13.08	15.25
20	5.00	2.2361	6.71	8.94	11.18	13.42	15.65
21	5.25	2.2913	6.87	9.17	11.46	13.75	16.04
22	5.50	2.3452	7.04	9.38	11.73	14.07	16.42
23	5.75	2.3979	7.19	9.59	11.99	14.39	16.79
24	6.00	2.4495	7.35	9.80	12.25	14.70	17.15
25	6.25	2.5000	7.50	10.00	12.50	15.00	17.50
26	6.50	2.5495	7.65	10.20	12.75	15.30	17.85
27	6.75	2.5981	7.79	10.39	12.99	15.59	18.19
28	7.00	2.6458	7.94	10.58	13.23	15.87	18.52
29	7.25	2.6926	8.08	10.77	13.46	16.16	18.85
30	7.50	2.7386	8.22	10.95	13.69	16.43	19.17
31	7.75	2.7839	8.35	11.14	13.92	16.70	19.49
32	8.00	2.8284	8.48	11.31	14.14	16.97	19.80
33	8.25	2.8723	8.62	11.49	14.36	17.23	20.10
34	8.50	2.9155	8.75	11.66	14.58	17.49	20.41
35	8.75	2.9580	8.87	11.83	14.79	17.75	20.71
36	9.00	3.0000	9.00	12.00	15.00	18.00	21.00
37	9.25	3.0414	9.12	12.17	15.21	18.25	21.29
38	9.50	3.0822	9.25	12.33	15.41	18.49	21.57
39	9.75	3.1225	9.37	12.49	15.61	18.73	21.86
40	10.00	3.1623	9.49	12.65	15.81	18.97	22.13
41	10.25	3.2016	9.61	12.81	16.01	19.21	22.41
42	10.50	3.2404	9.72	12.96	16.20	19.44	22.68
43	10.75	3.2787	9.84	13.11	16.39	19.67	22.95
44	11.00	3.3166	9.95	13.27	16.58	19.90	23.22
45	11.25	3.3541	10.06	13.42	16.77	20.12	23.48
46	11.50	3.3912	10.17	13.56	16.96	20.35	23.74
47	11.75	3.4278	10.28	13.71	17.14	20.57	24.00
48	12.00	3.4641	10.39	13.86	17.32	20.78	24.25
49	12.25	3.5000	10.50	14.00	17.50	21.00	24.50
50	12.50	3.5355	10.61	14.14	17.68	21.21	24.75

TWIST TABLES, FOUR PLY

No. of Yarn to be Twisted	No. of Twisted Yarn	Sq. Root of No. of Twisted Yarn	Twist in One Inch — Square Root Multiplied by				
			3	4	5	6	7
51	12.75	3.5707	10.71	14.28	17.85	21.42	25.00
52	13.00	3.6056	10.82	14.42	18.03	21.63	25.24
53	13.25	3.6401	10.92	14.56	18.20	21.84	25.48
54	13.50	3.6742	11.02	14.70	18.37	22.05	25.72
55	13.75	3.7081	11.12	14.83	18.54	22.25	25.96
56	14.00	3.7417	11.23	14.97	18.71	22.45	26.19
57	14.25	3.7749	11.33	15.10	18.87	22.65	26.43
58	14.50	3.8079	11.42	15.23	19.04	22.85	26.66
59	14.75	3.8406	11.52	15.36	19.20	23.04	26.89
60	15.00	3.8730	11.62	15.49	19.37	23.24	27.11
61	15.25	3.9051	11.72	15.62	19.53	23.43	27.34
62	15.50	3.9370	11.81	15.75	19.69	23.62	27.56
63	15.75	3.9686	11.91	15.88	19 84	23.81	27.78
64	16.00	4.0000	12.00	16.00	20.00	24.00	28.00
65	16.25	4.0311	12.09	16.12	20.16	24.19	28.22
66	16.50	4.0620	12.19	16.25	20.31	24.37	28.43
67	16.75	4.0927	12.28	16.37	20.46	24.56	28.65
68	17.00	4.1231	12.37	16.49	20.62	24.74	28.86
69	17.25	4.1533	12.46	16.61	20.77	24.92	29.07
70	17.50	4.1833	12.55	16.73	20.92	25.10	29.28
71	17.75	4.2130	12.64	16.85	21.07	25.28	29.49
72	18.00	4.2426	12.73	16.97	21.21	25.46	29.70
73	18.25	4.2720	12.82	17.09	21.36	25.63	29.90
74	18.50	4.3012	12.90	17.20	21.51	25.81	30.11
75	18.75	4.3301	12.99	17.32	21.65	25.98	30.31
76	19.00	4.3589	....	17.44	21.79	26.15	30.51
77	19.25	4.3875	....	17.55	21.94	26.32	30.72
78	19.50	4.4159	....	17.66	22.08	26.50	30.91
79	19.75	4.4441	....	17.78	22.22	26.66	31.11
80	20.00	4.4721	....	17.89	22.36	26.83	31.30
81	20.25	4.5000	....	18.00	22.50	27.00	31.50
82	20.50	4.5277	....	18.11	22.64	27.17	31.70
83	20.75	4.5552	....	18.22	22.78	27.33	31.89
84	21.00	4.5826	....	18.33	22.91	27.50	32.08
85	21.25	4.6098	....	18.44	23.05	27.66	32.27
86	21.50	4.6368	....	18.55	23.18	27.82	32.46
87	21.75	4.6637	....	18.66	23.32	27.98	32.65
88	22.00	4.6904	....	18.76	23.45	28.14	32.83
89	22.25	4.7170	....	18.87	23.58	28.30	33.02
90	22.50	4.7434	....	18.97	23.72	28.46	33.20
91	22.75	4.7697	....	19.08	23.85	28.62	33.39
92	23.00	4.7958	....	19.18	23.98	28.77	33.57
93	23.25	4.8218	....	19.29	24.11	28.93	33.75
94	23.50	4.8477	....	19.39	24.24	29.09	33.94
95	23.75	4.8734	....	19.49	24.37	29.24	34.11
96	24.00	4.8990	....	19.60	24.49	29.39	34.29
97	24.25	4.9244	....	19.70	24.62	29.55	34.47
98	24.50	4.9497	....	19.80	24.75	29.70	34.65
99	24.75	4.9749	....	19.90	24.87	29.85	34.83
100	25.00	5.0000	....	20.00	25.00	30.00	35.00

TWIST TABLES, FIVE PLY

No. of Yarn to be Twisted	No. of Twisted Yarn	Sq. Root of No. of Twisted Yarn	Twist in One Inch				
			Square Root Multiplied by				
			3	4	5	6	7
1	.2	.4472	1.34	1.79	2.24	2.68	3.13
2	.4	.6325	1.90	2.53	3.16	3.79	4.42
3	.6	.7746	2.33	3.10	3.87	4.65	5.43
4	.8	.8944	2.68	3.58	4.47	5.37	6.26
5	1.0	1.0000	3.00	4.00	5.00	6.00	7.00
6	1.2	1.0954	3.29	4.38	5.48	6.57	7.67
7	1.4	1.1832	3.55	4.73	5.92	7.10	8.28
8	1.6	1.2649	3.80	5.06	6.32	7.59	8.86
9	1.8	1.3416	4.03	5.37	6.71	8.05	9.39
10	2.0	1.4142	4.24	5.66	7.07	8.49	9.90
11	2.2	1.4832	4.45	5.93	7.42	8.90	10.38
12	2.4	1.5492	4.65	6.20	7.75	9.30	10.84
13	2.6	1.6125	4.84	6.45	8.06	9.67	11.28
14	2.8	1.6733	5.02	6.69	8.37	10.04	11.71
15	3.0	1.7321	5.20	6.93	8.66	10.39	12.12
16	3.2	1.7889	5.37	7.16	8.95	10.73	12.52
17	3.4	1.8439	5.53	7.38	9.22	11.06	12.91
18	3.6	1.8974	5.69	7.59	9.49	11.38	13.28
19	3.8	1.9494	5.85	7.80	9.75	11.70	13.64
20	4.0	2.0000	6.00	8.00	10.00	12.00	14.00
21	4.2	2.0494	6.15	8.20	10.25	12.30	14.34
22	4.4	2.0976	6.29	8.39	10.49	12.59	14.69
23	4.6	2.1448	6.44	8.58	10.72	12.87	15.02
24	4.8	2.1909	6.57	8.76	10.95	13.15	15.34
25	5.0	2.2361	6.71	8.94	11.18	13.42	15.65
26	5.2	2.2804	6.84	9.12	11.40	13.68	15.96
27	5.4	2.3238	6.97	9.30	11.62	13.94	16.27
28	5.6	2.3664	7.10	9.47	11.83	14.20	16.56
29	5.8	2.4083	7.22	9.63	12.04	14.45	16.86
30	6.0	2.4495	7.35	9.80	12.25	14.70	17.14
31	6.2	2.4900	7.47	9.96	12.45	14.94	17.43
32	6.4	2.5298	7.59	10.12	12.65	15.18	17.71
33	6.6	2.5690	7.71	10.28	12.85	15.41	17.98
34	6.8	2.6077	7.82	10.43	13.04	15.65	18.26
35	7.0	2.6458	7.94	10.58	13.23	15.87	18.52
36	7.2	2.6833	8.05	10.73	13.42	16.10	18.78
37	7.4	2.7203	8.16	10.88	13.60	16.32	19.04
38	7.6	2.7568	8.27	11.03	13.78	16.54	19.30
39	7.8	2.7928	8.38	11.17	13.96	16.76	19.55
40	8.0	2.8284	8.48	11.31	14.14	16.97	19.80
41	8.2	2.8636	8.59	11.45	14.32	17.18	20.05
42	8.4	2.8983	8.69	11.59	14.49	17.39	20.29
43	8.6	2.9326	8.80	11.73	14.66	17.60	20.53
44	8.8	2.9665	8.90	11.87	14.83	17.80	20.76
45	9.0	3.0000	9.00	12.00	15.00	18.00	21.00
46	9.2	3.0332	9.10	12.13	15.17	18.20	21.23
47	9.4	3.0659	9.20	12.26	15.33	18.40	21.46
48	9.6	3.0984	9.29	12.39	15.49	18.59	21.69
49	9.8	3.1305	9.39	12.52	15.65	18.78	21.91
50	10.0	3.1623	9.49	12.65	15.81	18.97	22.13

TWIST TABLES, FIVE PLY

No. of Yarn to be Twisted	No. of Twisted Yarn	Sq. Root of No. of Twisted Yarn	Twist in One Inch				
			Square Root Multiplied by				
			3	4	5	6	7
51	10.2	3.1937	9.58	12.77	15.97	19.16	22.36
52	10.4	3.2249	9.68	12.90	16.12	19.35	22.58
53	10.6	3.2558	9.77	13.02	16.28	19.53	22.79
54	10.8	3.2863	9.86	13.15	16.43	19.72	23.00
55	11.0	3.3166	9.95	13.27	16.58	19.90	23.22
56	11.2	3.3466	10.04	13.39	16.73	20.08	23.43
57	11.4	3.3764	10.13	13.51	16.88	20.26	23.63
58	11.6	3.4059	10.22	13.62	17.03	20.44	23.84
59	11.8	3.4351	10.31	13.74	17.18	20.61	24.05
60	12.0	3.4641	10.39	13.86	17.32	20.78	24.25
61	12.2	3.4928	10.48	13.97	17.46	20.96	24.45
62	12.4	3.5214	10.56	14.09	17.61	21.13	24.65
63	12.6	3.5496	10.65	14.20	17.75	21.30	24.85
64	12.8	3.5777	10.73	14.31	17.89	21.47	25.05
65	13.0	3.6056	10.82	14.42	18 03	21.63	25.24
66	13.2	3.6332	10.90	14.53	18.17	21.80	25.43
67	13.4	3.6606	10.98	14.64	18.30	21.96	25.63
68	13.6	3.6878	11.06	14.75	18.44	22.13	25.82
69	13.8	3.7148	11.15	14.86	18.56	22.29	26.01
70	14.0	3.7417	11.23	14.97	18.71	22.45	26.19
71	14.2	3.6783	11.31	15.07	18.84	22.61	26.38
72	14.4	3.7948	11.39	15.18	18.97	22.77	26.57
73	14.6	3.8210	11.46	15.28	19.10	22.93	26.75
74	14.8	3.8471	11.54	15.38	19.24	23.08	26.93
75	15.0	3.8730	11.62	15.49	19.37	23.24	27.11
76	15.2	3.8987	....	15.60	19.49	23.39	27.29
77	15.4	3.9243	....	15.70	19.62	23.55	27.47
78	15.6	3.9497	....	15.80	19.75	23.70	27.65
79	15.8	3.9749	....	15.90	19.87	23.85	27.83
80	16.0	4.0000	....	16.00	20.00	24.00	28.00
81	16.2	4.0249	....	16.10	20.12	24.15	28.18
82	16.4	4.0497	....	16.20	20.25	24.30	28.35
83	16.6	4.0743	....	16.30	20.37	24.45	28.52
84	16.8	4.0988	....	16.40	20.49	24.59	28.69
85	17.0	4.1231	....	16.49	20.62	24.74	28.86
86	17.2	4.1473	....	16.59	20.74	24.88	29.03
87	17.4	4.1713	....	16.68	20.86	25.03	29.20
88	17.6	4.1952	....	16.78	20.98	25.17	29.37
89	17.8	4.2190	....	16.88	21.10	25.31	29.53
90	18.0	4.2426	....	16.97	21.21	25.46	29.70
91	18.2	4.2661	....	17.06	21.33	25.60	29.86
92	18.4	4.2895	....	17.16	21.45	25.74	30.03
93	18.6	4.3128	....	17.25	21.56	25.88	30.19
94	18.8	4.3359	....	17.34	21.68	26.02	30.35
95	19.0	4.3589	....	17.44	26.15	26.15	30.51
96	19.2	4.3818	....	17.53	26.29	26.29	30.67
97	19.4	4.4045	....	17.62	26.43	26.43	30.84
98	19.6	4.4272	....	17.71	26.50	26.50	30.99
99	19.8	4.4497	....	17.80	26.70	26.70	31.15
100	20.0	4.4721	....	17.89	26.83	26.83	31.30

TWIST TABLES, SIX PLY

No. of Yarn to be Twisted	No. of Twisted Yarn	Sq. Root of No. of Twisted Yarn	Twist in One Inch — Square Root Multiplied by				
			3	4	5	6	7
1	.17	.4082	1.22	1.63	2.04	2.45	2.86
2	.33	.5774	1.73	2.31	2.89	3.46	4.04
3	.50	.7071	2.12	2.83	3.54	4.24	4.95
4	.67	.8165	2.45	3.27	4.08	4.90	5.72
5	.83	.9129	2.74	3.65	4.56	5.48	6.39
6	1.00	1.0000	3.00	4.00	5.00	6.00	7.00
7	1.17	1.0801	3.24	4.32	5.40	6.48	7.56
8	1.33	1.1547	3.47	4.62	5.77	6.93	8.08
9	1.50	1.2247	3.68	4.90	6.12	7.35	8.57
10	1.67	1.2910	3.87	5.16	6.45	7.75	9.04
11	1.83	1.3540	4.06	5.42	6.77	8.12	9.48
12	2.00	1.4142	4.24	5.66	7.07	8.49	9.90
13	2.17	1.4720	4.42	5.89	7.36	8.83	10.30
14	2.33	1.5275	4.58	6.11	7.64	9.17	10.70
15	2.50	1.5811	4.74	6.32	7.91	9.49	11.07
16	2.67	1.6330	4.90	6.53	8.16	9.80	11.43
17	2.83	1.6833	5.05	6.73	8.42	10.10	11.78
18	3.00	1.7321	5.20	6.93	8.66	10.39	12.12
19	3.17	1.7795	5.34	7.12	8.90	10.68	12.46
20	3.33	1.8257	5.48	7.30	9.13	10.95	12.78
21	3.50	1.8708	5.61	7.48	9.35	11.22	13.10
22	3.67	1.9149	5.75	7.66	9.57	11.49	13.41
23	3.83	1.9579	5.87	7.83	9.79	11.75	13.71
24	4.00	2.0000	6.00	8.00	10.00	12.00	14.00
25	4.17	2.0412	6.12	8.16	10.21	12.25	14.29
26	4.33	2.0817	6.25	8.33	10.41	12.49	14.57
27	4.50	2.1213	6.36	8.49	10.61	12.73	14.85
28	4.67	2.1602	6.48	8.64	10.80	12.96	15.12
29	4.83	2.1985	6.60	8.79	10.99	13.19	15.39
30	5.00	2.2361	6.71	8.94	11.18	13.42	15.65
31	5.17	2.2730	6.82	9.09	11.37	13.64	15.91
32	5.33	2.3094	6.93	9.24	11.55	13.86	16.16
33	5.50	2.3452	7.04	9.38	11.73	14.07	16.42
34	5.67	2.3805	7.14	9.52	11.90	14.28	16.67
35	5.83	2.4152	7.25	9.66	12.08	14.49	16.91
36	6.00	2.4495	7.35	9.80	12.25	14.70	17.15
37	6.17	2.4833	7.45	9.93	12.42	14.90	17.38
38	6.33	2.5166	7.55	10.07	12.58	15.10	17.62
39	6.50	2.5495	7.65	10.20	12.75	15.30	17.85
40	6.67	2.5820	7.75	10.33	12.91	15.49	18.07
41	6.83	2.6141	7.84	10.46	13.07	15.68	18.30
42	7.00	2.6458	7.94	10.58	13.23	15.87	18.52
43	7.17	2.6771	8.03	10.71	13.39	16.06	18.74
44	7.33	2.7080	8.12	10.83	13.54	16.25	18.96
45	7.50	2.7386	8.22	10.95	13.69	16.43	19.17
46	7.67	2.7689	8.31	11.08	13.84	16.61	19.38
47	7.83	2.7988	8.39	11.20	13.99	16.79	19.59
48	8.00	2.8284	8.48	11.31	14.14	16.97	19.80
49	8.17	2.8577	8.57	11.43	14.29	17.15	20.01
50	8.33	2.8868	8.66	11.55	14.43	17.32	20.21

TWIST TABLES, SIX PLY

No. of Yarn to be Twisted	No. of Twisted Yarn	Sq. Root of No. of Twisted Yarn	Twist in One Inch				
			Square Root Multiplied by				
			3	4	5	6	7
51	8.50	2.9155	8.75	11.66	14.58	17.49	20.41
52	8.67	2.9439	8.83	11.78	14.72	17.66	20.61
53	8.83	2.9721	8.92	11.89	14.86	17.83	20.80
54	9.00	3.0000	9.00	12.00	15.00	18.00	21.00
55	9.17	3.0277	9.08	12.11	15.14	18.17	21.20
56	9.33	3.0551	9.17	12.22	15.28	18.33	21.39
57	9.50	3.0822	9.25	12.33	15.41	18.49	21.57
58	9.67	3.1091	9.33	12.44	15.55	18.65	21.76
59	9.83	3.1358	9.41	12.54	15.68	18.81	21.95
60	10.00	3.1623	9.49	12.65	15.81	18.97	22.13
61	10.17	3.1885	9.57	12.75	15.94	19.13	22.32
62	10.33	3.2145	9.65	12.86	16.07	19.29	22.50
63	10.50	3.2404	9.72	12.96	16.20	19.44	22.68
64	10.67	3.2659	9.80	13.06	16.33	19.60	22.86
65	10.83	3.2914	9.87	13.17	16.46	19.75	23.04
66	11.00	3.3166	9.95	13.27	16.58	19.90	23.22
67	11.17	3.3417	10.03	13.37	16.71	20.05	23.39
68	11.33	3.3665	10.10	13.47	16.83	20.20	23.57
69	11.50	3.3912	10.17	13.56	16.96	20.35	23.74
70	11.67	3.4157	10.25	13.66	17.08	20.49	23.91
71	11.83	3.4400	10.32	13.76	17.20	20.64	24.08
72	12.00	3.4641	10.39	13.86	17.32	20.78	24.25
73	12.17	3.4881	10.47	13.95	17.44	20.93	24.42
74	12.33	3.5119	10.54	14.05	17.56	21.07	24.58
75	12.50	3.5355	10.61	14.14	17.68	21.21	24.75
76	12.67	3.5590	....	14.24	17.80	21.35	24.91
77	12.83	3.5824	....	14.33	17.91	21.49	25.07
78	13.00	3.6056	....	14.42	18.03	21.63	25.24
79	13.17	3.6286	....	14.52	18.14	21.77	25.40
80	13.33	3.6515	....	14.60	18.26	21.91	25.56
81	13.50	3.6742	....	14.70	18.37	22.05	25.72
82	13.67	3.6969	....	14.79	18.48	22.18	25.88
83	13.83	3.7192	....	14.88	18.60	22.32	26.03
84	14.00	3.7417	....	14.97	18.71	22.45	26.19
85	14.17	3.7639	....	15.06	18.82	22.58	26.35
86	14.33	3.7859	....	15.14	18.93	22.72	26.50
87	14.50	3.8079	....	15.23	19.04	22.85	26.66
88	14.67	3.8297	....	15.32	19.15	22.98	26.81
89	14.83	3.8514	....	15.40	19.26	23.11	26.96
90	15.00	3.8730	....	15.49	19.36	23.24	27.11
91	15.17	3.8944	....	15.58	19.47	23.37	27.26
92	15.33	3.9158	....	15.66	19.58	23.49	27.41
93	15.50	3.9370	....	15.75	19.69	23.62	27.56
94	15.67	3.9582	....	15.83	19.79	23.75	27.71
95	15.83	3.9791	....	15.92	19.90	23.87	27.85
96	16.00	4.0000	....	16.00	20.00	24.00	28.00
97	16.17	4.0208	....	16.08	20.10	24.12	28.15
98	16.33	4.0415	....	16.17	20.21	24.25	28.29
99	16.50	4.0620	....	16.25	20.31	24.37	28.43
100	16.67	4.0825	....	16.33	20.41	24.49	28.57

TWIST TABLES. EIGHT AND TEN PLY

EIGHT PLY					TEN PLY				
No. of Yarn to be Twisted	No. of Twisted Yarn	Sq. Root of No. of Twisted Yarn	Twist per Inch — Square Root Multiplied by		No. of Yarn to be Twisted	No. of Twisted Yarn	Sq. Root of No. of Twisted Yarn	Twist per Inch — Square Root Multiplied by	
			4	5				4	5
1	.125	.3536	1.41	1.77	1	.10	.3162	1.26	1.58
2	.250	.5000	2.00	2.50	2	.20	.4472	1.79	2.24
3	.375	.6123	2.45	3.06	3	.30	.5477	2.19	2.74
4	.500	.7071	2.83	3.54	4	.40	.6325	2.53	3.16
5	.625	.7905	3.16	3.95	5	.50	.7071	2.83	3.54
6	.750	.8660	3.46	4.33	6	.60	.7746	3.10	3.87
7	.875	.9354	3.74	4.68	7	.70	.8366	3.35	4.18
8	1.000	1.0000	4.00	5.00	8	.80	.8944	3.58	4.47
9	1.125	1.0606	4.24	5.30	9	.90	.9486	3.79	4.74
10	1.250	1.1180	4.47	5.59	10	1.00	1.0000	4.00	5.00
11	1.375	1.1726	4.69	5.86	11	1.10	1.0488	4.20	5.24
12	1.500	1.2247	4.90	6.12	12	1.20	1.0954	4.38	5.48
13	1.625	1.2747	5.10	6.37	13	1.30	1.1417	4.57	5.71
14	1.750	1.3229	5.29	6.61	14	1.40	1.1832	4.73	5.92
15	1.875	1.3618	5.45	6.81	15	1.50	1.2247	4.90	6.12
16	2.000	1.4142	5.66	7.07	16	1.60	1.2649	5.06	6.32
17	2.125	1.4577	5.83	7.29	17	1.70	1.3038	5.22	6.52
18	2.250	1.5000	6.00	7.50	18	1.80	1.3416	5.37	6.71
19	2.375	1.5411	6.16	7.71	19	1.90	1.3784	5.51	6.89
20	2.500	1.5811	6.32	7.91	20	2.00	1.4142	5.66	7.07
21	2.625	1.6218	6.49	8.11	21	2.10	1.4491	5.80	7.25
22	2.750	1.6583	6.63	8.29	22	2.20	1.4832	5.93	7.42
23	2.875	1.6955	6.78	8.48	23	2.30	1.5165	6.07	7.58
24	3.000	1.7321	6.93	8.66	24	2.40	1.5492	6.20	7.75
25	3.125	1.7677	7.07	8.84	25	2.50	1.5811	6.32	7.91
26	3.250	1.8028	7.21	9.01	26	2.60	1.6125	6.45	8.06
27	3.375	1.8371	7.35	9.19	27	2.70	1.6431	6.57	8.22
28	3.500	1.8708	7.48	9.35	28	2.80	1.6733	6.69	8.37
29	3.625	1.9039	7.62	9.52	29	2.90	1.7029	6.81	8.51
30	3.750	1.9365	7.75	9.68	30	3.00	1.7321	6.93	8.66
31	3.875	1.9685	7.87	9.84	31	3.10	1.7606	7.04	8.80
32	4.000	2.0000	8.00	10.00	32	3.20	1.7889	7.16	8.94
33	4.125	2.0310	8.12	10.16	33	3.30	1.8166	7.27	9.08
34	4.250	2.0616	8.25	10.31	34	3.40	1.8439	7.38	9.22
35	4.375	2.0916	8.37	10.46	35	3.50	1.8708	7.48	9.35
36	4.500	2.1213	8.49	10.61	36	3.60	1.8974	7.59	9.49
37	4.625	2.1505	8.60	10.75	37	3.70	1.9235	7.69	9.62
38	4.750	2.1794	8.72	10.90	38	3.80	1.9494	7.80	9.75
39	4.875	2.2079	8.83	11.04	39	3.90	1.9748	7.90	9.87
40	5.000	2.2361	8.94	11.18	40	4.00	2.0000	8.00	10.00
41	5.125	2.2638	9.06	11.32	41	4.10	2.0248	8.10	10.12
42	5.250	2.2913	9.17	11.46	42	4.20	2.0494	8.20	10.25
43	5.375	2.3184	9.27	11.59	43	4.30	2.0736	8.29	10.37
44	5.500	2.3452	9.38	11.73	44	4.40	2.0976	8.39	10.49
45	5.625	2.3717	9.49	11.86	45	4.50	2.1213	8.49	10.61
46	5.750	2.3979	9.59	11.99	46	4.60	2.1448	8.58	10.72
47	5.875	2.4238	9.70	12.12	47	4.70	2.1679	8.67	10.84
48	6.000	2.4495	9.80	12.25	48	4.80	2.1909	8.76	10.95
49	6.125	2.4748	9.90	12.37	49	4.90	2.2126	8.85	11.06
50	6.250	2.5000	10.00	12.50	50	5.00	2.2361	8.94	11.18

Production Calculations

THE following pages contain tables of production for such combinations of yarn, twist and ply as are sufficient for the needs of the majority of mills. The R. P. M. of spindle and diameter of ring indicated for the various sizes of yarn have been selected as approximately correct.

The R. P. M. of front roll is the basis upon which production is figured, and is obtained as follows:

$$\frac{\text{R. P. M. of Spindle}}{\text{Twist per inch} \times \text{Cir. of Front Roll}} = \text{R. P. M. Bottom Roll}$$

The rule for production is as follows:

$$\frac{\text{R. P. M. of Bottom Roll} \times \text{Cir. of Bottom Roll} \times 600 \text{ (min. in 10 hours)}}{30240 \text{ (ins. in 1 hank)} \times \text{No. of Twisted Yarn}} = \text{Lbs. per Spindle in 10 hours continuous running}$$

For example:

2 ply, No. 6 yarn. No. of Twisted yarn 3. R. P. M. of Roll 196. Cir. of $1\frac{1}{2}''$ Roll 4.7124.

$$\frac{196 \times 4.7124 \times 600}{30240 \times 3} = 6.11 \text{ lbs.}$$

The production as given in the tables is a theoretical one and should be taken only as a basis for figuring actual production. As conditions vary in different mills, it is not advisable in the tables to deduct for stoppages and other losses. We indicate below the percentage which we have found to be approximately correct under ordinary conditions for covering losses of all kinds in the case of ring twisters with spool creels. If the actual conditions in a particular mill indicate that a different percentage is more accurate, then such percentage should be used.

In the example given above the actual production according to our table of allowances would be $6.11 \times .84 = 5.13$.

The use of beam creels for eight ply or higher greatly reduces the percentage allowance for stoppages, and with this process it will be as low as five to ten per cent.

RING TWISTERS

PERCENT OF ALLOWANCE FOR STOPPAGES

APPROXIMATELY CORRECT UNDER NORMAL CONDITIONS

No. of Yarn to be Twisted	2 Ply	3 Ply	4 Ply	5 Ply	6 Ply	8 Ply	10 Ply	No. of Yarn to be Twisted
6	16	17	18	20	22	25	30	6
7	16	17	18	19	21	24	29	7
8	15	16	17	19	20	23	28	8
9	15	16	17	18	20	23	28	9
10	14	15	16	18	19	22	27	10
12	14	15	16	17	19	22	27	12
14	13	14	16	17	18	21	26	14
16	13	14	15	16	18	21	26	16
18	13	14	15	16	18	21	26	18
20	12	13	15	16	17	20	25	20
22	12	13	14	15	17	20	25	22
24	12	13	14	15	17	20	25	24
26	11	12	14	15	16	20	25	26
28	11	12	13	15	16	19	25	28
30	11	12	13	14	16	19	24	30
32	10	11	13	14	15	19	24	32
34	10	11	12	14	15	19	24	34
36	10	11	12	14	15	18	24	36
38	9	10	12	13	15	18	24	38
40	9	10	11	13	14	18	23	40
42	9	10	11	13	14	18	..	42
44	8	9	11	13	14	18	..	44
46	8	9	11	12	14	17	..	46
48	8	9	10	12	13	17	..	48
50	7	8	10	12	13	17	..	50
60	7	8	9	11	12	..	..	60
70	6	7	8	10	11	..	..	70
80	6	7	8	10	11	..	..	80

2 PLY

PRODUCTION TABLE FOR RING TWISTERS

POUNDS PER SPINDLE FOR 10 HOURS, RUNNING 100%

1½″ ROLL

No. of Yarn to be Twisted	R. P. M. of Spindle	Diam. of Ring	Multiplier 3		Multiplier 4		Multiplier 5		Multiplier 6		No. of Yarn to be Twisted
			R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	
6	4800	3½″	196	6.11	147	4.58	118	3.68	98	3.05	6
7	"	"	182	4.86	136	3.63	109	2.91	91	2.43	7
8	"	"	170	3.97	127	2.97	102	2.38	85	1.99	8
9	"	"	160	3.32	120	2.49	96	1.99	80	1.66	9
10	5500	3″	174	3.25	131	2.45	104	1.94	87	1.63	10
12	"	"	159	2.48	119	1.85	95	1.48	79	1.23	12
14	"	"	147	1.96	110	1.47	92	1.23	74	.99	14
16	"	"	138	1.61	103	1.20	89	1.04	69	.81	16
18	"	"	130	1.35	97	1.01	78	.81	65	.68	18
20	6200	2½″	139	1.30	104	.97	83	.78	69	.65	20
22	"	"	132	1.12	99	.84	79	.67	66	.56	22
24	"	"	127	.99	95	.74	76	.59	63	.49	24
26	"	"	122	.88	91	.65	73	.53	61	.44	26
28	"	"	117	.78	88	.59	70	.47	59	.39	28
30	7000	2¼″	128	.80	96	.60	77	.48	64	.40	30
32	"	"	124	.72	93	.54	74	.43	62	.36	32
34	"	"	120	.66	90	.50	72	.40	60	.33	34
36	"	"	117	.61	88	.46	70	.36	58	.30	36
38	"	"	113	.56	85	.42	68	.33	57	.28	38
40	7500	2″	119	.56	89	.42	71	.33	59	.28	40
42	"	"	116	.52	87	.39	69	.31	58	.26	42
44	"	"	113	.48	85	.36	68	.29	57	.24	44
46	"	"	111	.45	83	.34	66	.27	55	.22	46
48	"	"	108	.42	81	.32	65	.25	54	.21	48
50	"	"	106	.40	80	.30	64	.24	53	.20	50
60	8000	1¾″	103	.32	78	.24	62	.19	52	.16	60
70	"	"	96	.26	72	.19	57	.15	48	.13	70
80	"	"	90	.21	67	.16	54	.13	45	.11	80

3 PLY

PRODUCTION TABLE FOR RING TWISTERS

POUNDS PER SPINDLE FOR 10 HOURS, RUNNING 100%

1½″ ROLL

No. of Yarn to be Twisted	R. P. M. of Spindle	Diam. of Ring	Multiplier 3		Multiplier 4		Multiplier 5		Multiplier 6		No. of Yarn to be Twisted
			R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	
6	4500	4″	225	10.52	169	7.90	135	6.31	112	5.24	6
7	"	"	209	8.39	156	6.26	125	5.02	104	4.17	7
8	"	"	195	6.83	146	5.11	117	4.10	97	3.40	8
9	"	"	184	5.73	138	4.30	110	3.43	92	2.87	9
10	5200	3½″	201	5.64	151	4.24	121	3.40	101	2.84	10
12	"	"	184	4.30	138	3.23	110	2.57	92	2.15	12
14	"	"	170	3.40	128	2.56	102	2.04	85	1 70	14
16	"	"	159	2.79	119	2.07	96	1.68	80	1.40	16
18	"	"	150	2.34	113	1.76	90	1.40	75	1.17	18
20	6000	3″	164	2.30	123	1.72	99	1.39	82	1.15	20
22	"	"	157	2.00	118	1.51	94	1.20	78	1.00	22
24	"	"	150	1.75	113	1.32	90	1.05	75	.88	24
26	"	"	144	1.55	108	1.16	87	.94	72	.78	26
28	"	"	139	1.39	104	1.04	83	.83	69	.69	28
30	6800	2½″	152	1.42	114	1.06	91	.85	76	.71	30
32	"	"	147	1.29	110	.96	88	.77	74	.65	32
34	"	"	143	1.18	107	.88	86	.71	71	.59	34
36	"	"	139	1.08	104	.81	83	.65	69	.54	36
38	"	"	135	1.00	101	.75	81	.60	68	.50	38
40	7300	2¼″	141	.99	106	.74	85	.60	71	.50	40
42	"	"	138	.92	103	.69	83	.55	69	.46	42
44	"	"	135	.86	101	.64	81	.52	67	.43	44
46	"	"	132	.81	99	.60	79	.48	66	.40	46
48	"	"	129	.75	97	.57	77	.45	65	.38	48
50	"	"	126	.71	95	.53	76	.43	63	.35	50
60	7800	2″	123	.58	92	.43	74	.35	62	.29	60
70	"	"	114	.46	86	.34	69	.28	57	.23	70
80	"	"	107	.38	80	.28	64	.22	53	.19	80

4 PLY

PRODUCTION TABLE FOR RING TWISTERS

POUNDS PER SPINDLE FOR 10 HOURS, RUNNING 100%

1½″ ROLL

No. of Yarn to be Twisted	R. P. M. of Spindle	Diam. of Ring	Multiplier 3		Multiplier 4		Multiplier 5		Multiplier 6		No. of Yarn to be Twisted
			R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	
6	4000	4½″	230	14.34	173	10.78	139	8.66	115	7.17	6
7	"	"	214	11.43	160	8.55	128	6.84	107	5.72	7
8	"	"	200	9.35	150	7.01	120	5.61	100	4.68	8
9	"	"	188	7.81	141	5.86	113	4.70	94	3.91	9
10	4700	4″	210	7.85	158	5.91	126	4.71	105	3.93	10
12	"	"	192	5.98	144	4.49	115	3.58	96	2.99	12
14	"	"	178	4.76	133	3.55	107	2.86	89	2.38	14
16	"	"	166	3.88	125	2.92	100	2.34	83	1.94	16
18	"	"	157	3.26	117	2.43	94	1.95	78	1.62	18
20	5500	3½″	174	3.25	131	2.45	104	1.94	87	1.63	20
22	"	"	166	2.82	124	2.11	99	1.68	83	1.41	22
24	"	"	159	2.48	119	1.85	95	1.48	79	1.23	24
26	"	"	153	2.20	114	1.64	92	1.32	76	1.09	26
28	"	"	147	1.96	110	1.47	88	1.18	74	.99	28
30	6300	3″	163	2.03	122	1.52	98	1.22	81	1.01	30
32	"	"	158	1.85	118	1.38	94	1.10	79	.92	32
34	"	"	153	1.68	115	1.27	92	1.01	76	.84	34
36	"	"	149	1.55	111	1.15	89	.92	74	.77	36
38	"	"	145	1.43	108	1.06	87	.86	72	.71	38
40	7000	2½″	157	1.47	117	1.09	94	.88	78	.73	40
42	"	"	153	1.36	115	1.02	92	.82	76	.68	42
44	"	"	149	1.27	112	.95	90	.77	75	.64	44
46	"	"	145	1.18	110	.89	88	.72	73	.59	46
48	"	"	143	1.11	107	.83	86	.67	72	.56	48
50	"	"	140	1.05	105	.79	84	.63	70	.52	50
60	7500	2¼″	137	.85	103	.64	82	.51	68	.42	60
70	"	"	127	.68	95	.51	76	.41	63	.34	70
80	"	"	119	.56	89	.42	71	.33	59	.28	80

5 PLY

PRODUCTION TABLE FOR RING TWISTERS

POUNDS PER SPINDLE FOR 10 HOURS, RUNNING 100%

1½" ROLL

No. of Yarn to be Twisted	R. P. M. of Spindle	Diam. of Ring	Multiplier 3		Multiplier 4		Multiplier 5		Multiplier 6		No. of Yarn to be Twisted
			R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	
6	3500	5"	226	17.69	170	13.25	136	10.60	113	8.80	6
7	"	"	209	13.96	157	10.49	126	8.42	105	7.01	7
8	"	"	196	11.45	147	8.59	118	6.90	98	5.73	8
9	"	"	184	9.56	138	7.17	111	5.77	92	4.78	9
10	4200	4½"	210	9.82	157	7.34	126	5.89	105	4.91	10
12	"	"	192	7.48	144	5.61	115	4.48	96	3.74	12
14	"	"	177	5.91	133	4.44	106	3.54	89	2.97	14
16	"	"	166	4.85	124	3.62	100	2.92	83	2.43	16
18	"	"	157	4.08	117	3.04	94	2.44	78	2.03	18
20	5000	4"	177	4.14	133	3.11	106	2.48	88	2.06	20
22	"	"	169	3.59	126	2.68	101	2.15	84	1.79	22
24	"	"	161	3.14	121	2.36	97	1.89	81	1.58	24
26	"	"	155	2.79	116	2.09	93	1.67	78	1.40	26
28	"	"	149	2.49	112	1.87	90	1.50	75	1.25	28
30	5800	3½"	167	2.60	126	1.96	100	1.56	84	1.31	30
32	"	"	162	2.37	122	1.78	97	1.42	81	1.18	32
34	"	"	157	2.16	118	1.62	94	1.29	79	1.09	34
36	"	"	153	1.99	115	1.49	92	1.19	76	.99	36
38	"	"	149	1.83	112	1.38	89	1.09	74	.91	38
40	6500	3"	163	1.91	122	1.43	97	1.13	81	.95	40
42	"	"	159	1.77	119	1.32	95	1.06	79	.88	42
44	"	"	155	1.65	116	1.23	93	.99	77	.82	44
46	"	"	152	1.54	114	1.16	91	.92	76	.77	46
48	"	"	148	1.44	111	1.08	89	.87	74	.72	48
50	"	"	145	1.36	109	1.02	87	.81	73	.68	50
60	7000	2½"	143	1.11	107	.83	86	.67	71	.55	60
70	"	"	132	.88	99	.66	79	.53	66	.44	70
80	"	"	124	.73	93	.54	74	.43	62	.36	80

6 PLY

PRODUCTION TABLE FOR RING TWISTERS

POUNDS PER SPINDLE FOR 10 HOURS, RUNNING 100%

1½″ ROLL

No. of Yarn to be Twisted	R. P. M. of Spindle	Diam. of Ring	Multiplier 3		Multiplier 4		Multiplier 5		Multiplier 6		No. of Yarn to be Twisted
			R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	
6	3000	5″	212	19.82	159	14.86	127	11.87	106	9.91	6
7	"	"	196	15.66	147	11.75	118	9.43	98	7.83	7
8	"	"	183	12.87	138	9.70	110	7.73	92	6.47	8
9	"	"	173	10.78	130	8.10	104	6.48	87	5.42	9
10	3700	4½″	203	11.37	152	8.51	122	6.83	101	5.65	10
12	"	"	185	8.65	139	6.50	111	5.19	92	4.30	12
14	"	"	171	6.86	128	5.14	103	4.13	86	3.45	14
16	"	"	160	5.60	120	4.20	96	3.36	80	2.80	16
18	"	"	151	4.71	113	3.52	91	2.84	76	2.37	18
20	4500	4″	174	4.93	131	3.71	105	2.97	87	2.47	20
22	"	"	166	4.23	125	3.18	100	2.55	83	2.11	22
24	"	"	159	3.72	119	2.78	95	2.22	80	1.87	24
26	"	"	153	3.30	115	2.48	92	1.99	76	1.64	26
28	"	"	147	2.94	111	2.22	88	1.76	74	1.48	28
30	5200	3½″	164	3.07	123	2.30	99	1.85	82	1.53	30
32	"	"	159	2.79	119	2.09	96	1.68	80	1.40	32
34	"	"	155	2.56	116	1.91	93	1.53	77	1.27	34
36	"	"	150	2.34	113	1.76	90	1.40	75	1.17	36
38	"	"	146	2.16	110	1.62	88	1.30	73	1.08	38
40	5800	3″	159	2.23	119	1.67	95	1.33	79	1.11	40
42	"	"	155	2.07	116	1.55	93	1.24	78	1.04	42
44	"	"	152	1.94	114	1.45	91	1.16	76	.97	44
46	"	"	148	1.80	111	1.35	89	1.08	74	.90	46
48	"	"	145	1.69	109	1.27	87	1.02	73	.85	48
50	"	"	142	1.59	107	1.20	85	.95	71	.80	50
60	6500	2¾″	145	1.36	109	1.02	87	.81	73	.68	60
70	"	"	135	1.08	101	.81	81	.65	67	.54	70
80	"	"	126	.88	94	.66	76	.53	63	.44	80

8 PLY
PRODUCTION TABLE FOR RING TWISTERS
POUNDS PER SPINDLE FOR 10 HOURS, RUNNING 100%
1½″ ROLL

No. of Yarn to be Twisted	R. P. M. of Spindle	Diam. of Ring	Multiplier 4		Multiplier 5		No. of Yarn to be Twisted
			R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	
6	2500	5″	153	19.08	123	15.34	6
7	"	"	142	15.18	113	12.08	7
8	"	"	133	12.44	106	9.91	8
9	"	"	125	10.38	100	8.63	9
10	3200	4½″	152	11.37	122	9.13	10
12	"	"	139	8.66	111	6.92	12
14	"	"	128	6.84	103	5.50	14
16	"	"	120	5.61	96	4.48	16
18	"	"	113	4.70	91	3.78	18
20	3800	4″	128	4.79	102	3.81	20
22	"	"	122	4.15	97	3.30	22
24	"	"	116	3.62	93	2.90	24
26	"	"	112	3.22	90	2.59	26
28	"	"	108	2.89	86	2.30	28
30	4400	3½″	121	3.02	97	2.42	30
32	"	"	117	2.74	93	2.17	32
34	"	"	113	2.49	91	2.00	34
36	"	"	110	2.29	88	1.83	36
38	"	"	107	2.11	86	1.69	38
40	5000	3″	83	1.55	66	1.23	40

10 PLY
PRODUCTION TABLE FOR RING TWISTERS
POUNDS PER SPINDLE FOR 10 HOURS, RUNNING 100%
1½″ ROLL

No. of Yarn to be Twisted	R. P. M. of Spindle	Diam. of Ring	Multiplier 4		Multiplier 5		No. of Yarn to be Twisted
			R. P. M. of Roll	Pounds per Spindle	R. P. M. of Roll	Pounds per Spindle	
6	2000	5½″	137	21.34	110	17.15	6
7	"	"	127	16.96	101	13.48	7
8	"	"	118	13.79	95	11.10	8
9	"	"	112	11.64	90	9.35	9
10	2500	5″	133	12.44	106	10.66	10
12	"	"	121	9.43	97	7.56	12
14	"	"	112	7.48	90	6.01	14
16	"	"	105	6.13	84	4.91	16
18	"	"	99	5.14	79	4.10	18
20	3000	4½″	113	5.28	90	4.21	20
22	"	"	107	4.55	86	3.66	22
24	"	"	103	4.01	82	3.20	24
26	"	"	99	3.56	79	2.84	26
28	"	"	95	3.17	76	2.54	28
30	3500	4″	82	2.56	65	2.03	30

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